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HOT FLOW TESTING OF MULTIPLE NOZZLE EXHAUST EDUCTOR SYSTEMS

James Allan Hill



NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

HOT FLOW TESTING OF MULTIPLE NOZZLE EXHAUST EDUCTOR SYSTEMS

by

James Allan Hill

September 1979

Thesis Advisor:

P.F. Pucci

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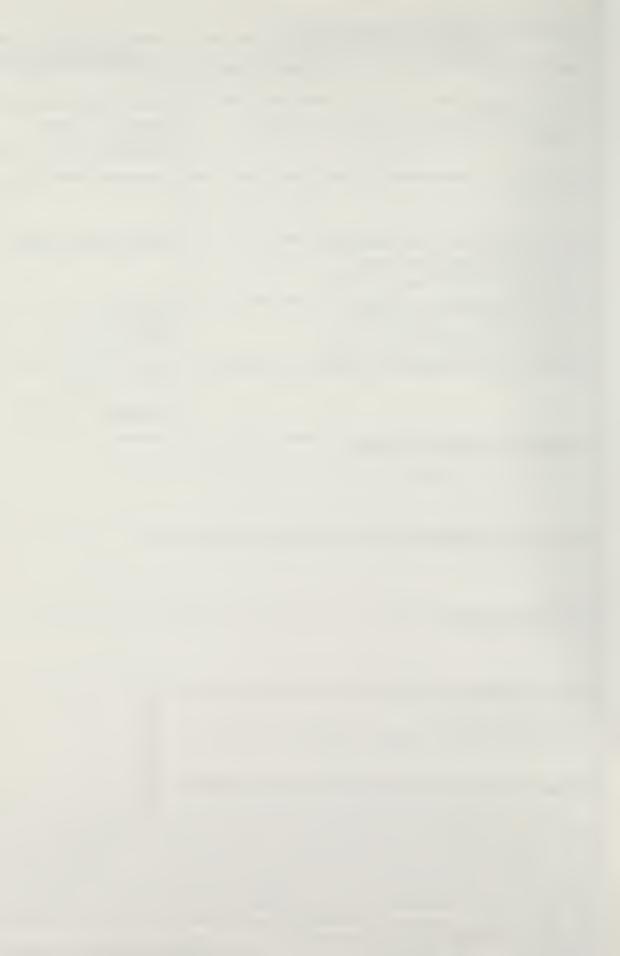
Hot Flow Model Multiple Nozzle Exhaust Eductor Systems

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Hot Flow Testing of Multiple Nozzle Exhaust Eductor Systems

by

James Allan Hill Lieutenant, United States Navy B.A. Economics, University of Nebraska, 1972

Submitted in partial fulfillment of the requirements for the degree of

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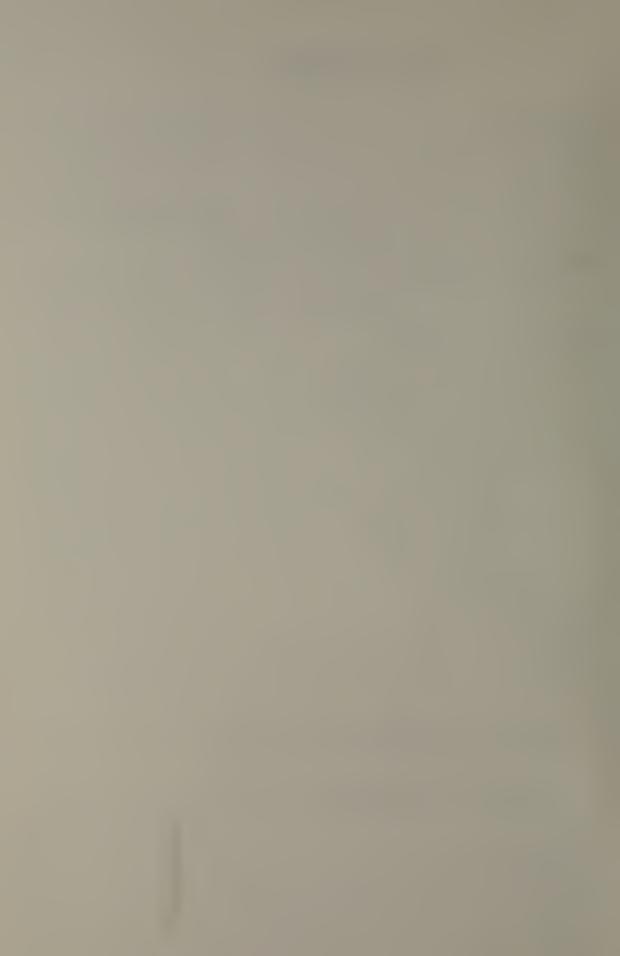
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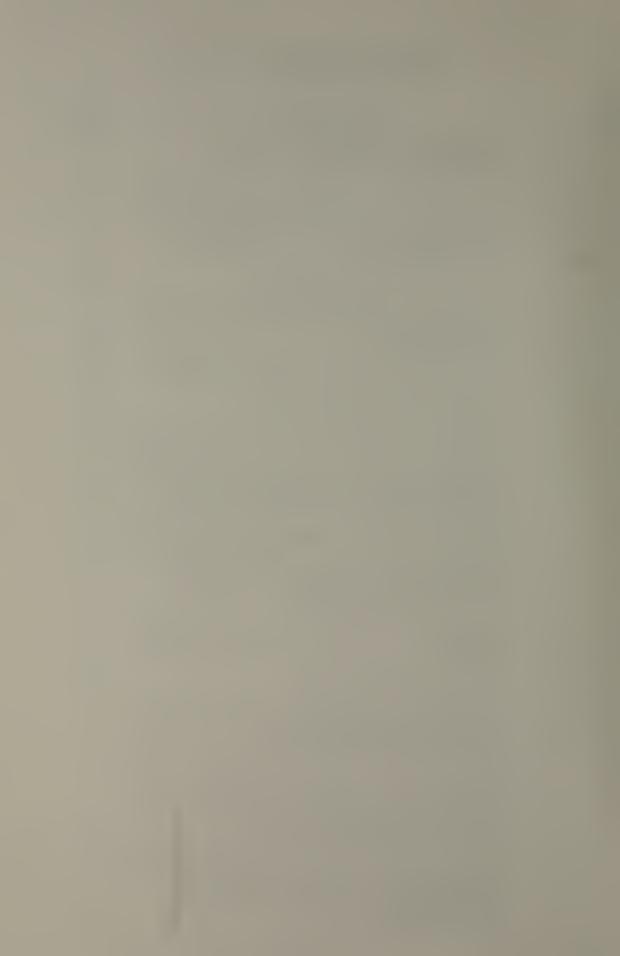


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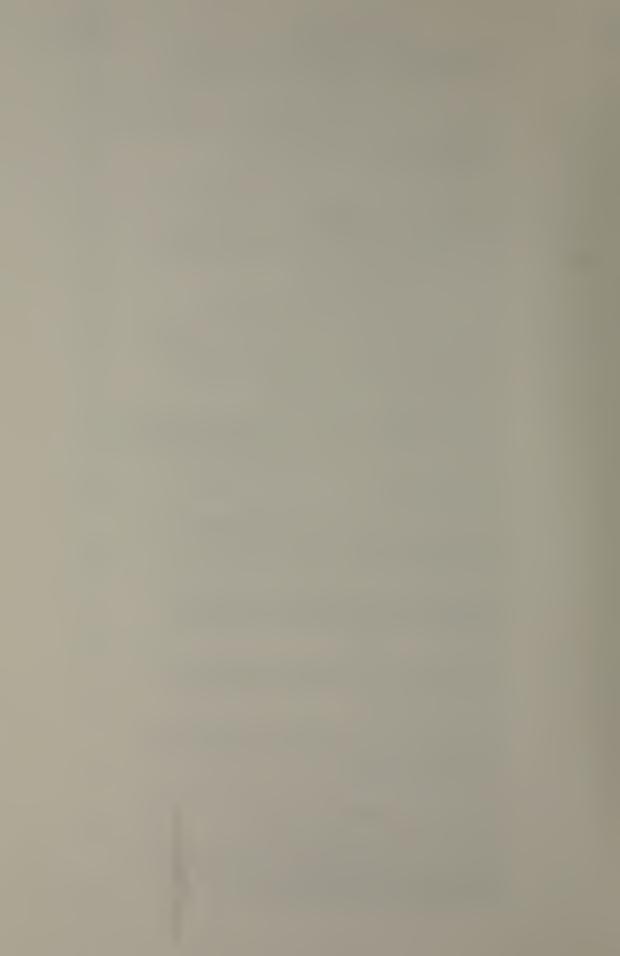
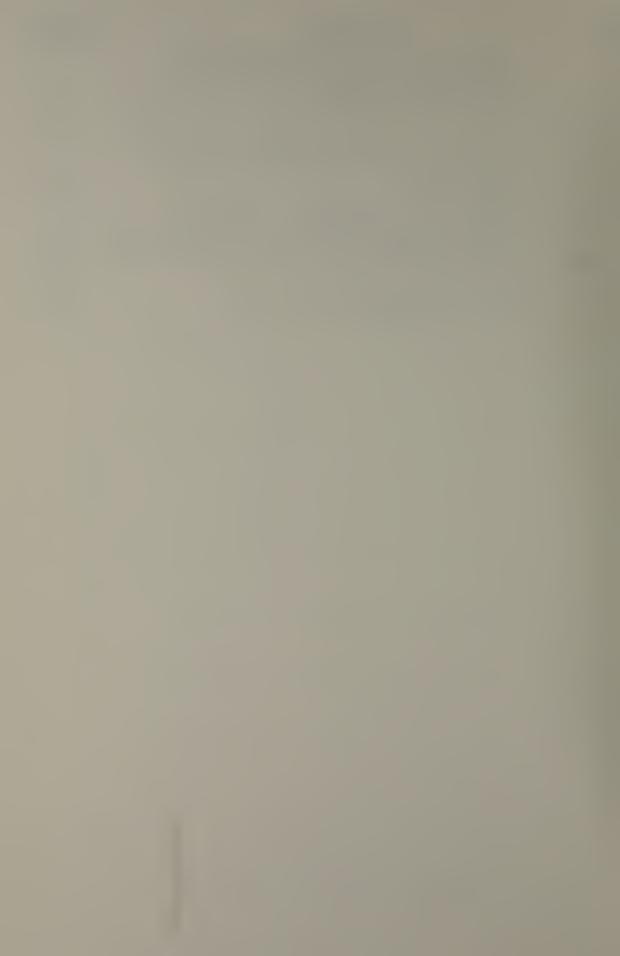
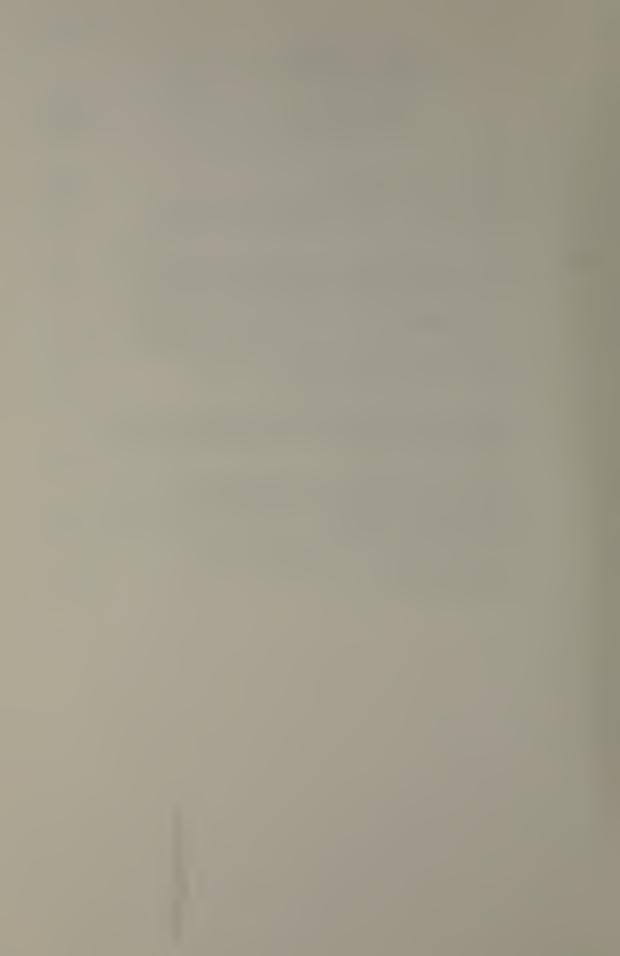


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NOMENCLATURE

ENGLISH LETTER SYMBOLS

A - Area, in²

C - Sonic velocity, ft/sec

D - Diameter, in

f - Friction factor

F - Functional denotation

F_{fr} - Wall skin-friction force, lbf

g_c - Proportionality factor in Newton's Second Law,
g_c = 32.174 lbm-ft/lbf-sec²

h - Enthalpy, Btu/lbm

k - Ratio of specific heats

L - Length, in

P - Pressure, in H₂O

Pa, B - Atmospheric pressure, in Hg

R - Gas constant for air, 53.34 ft-lbf/lbm-°R

S - Standoff distance, in

T - Temperature, °F, °R

U - Velocity, ft/sec

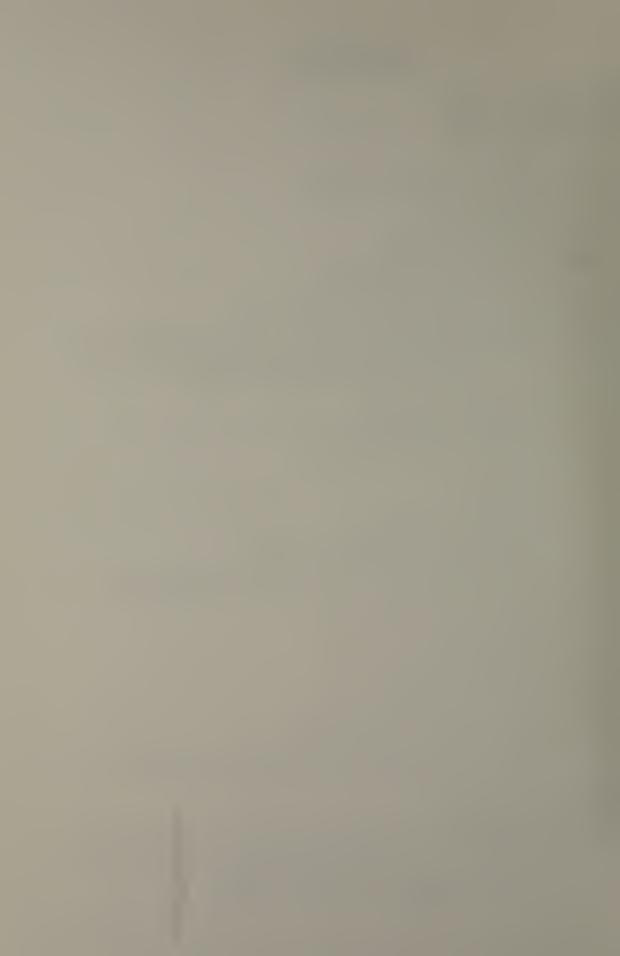
W, m - Mass flow rate, lbm/sec

x - Axial distance from mixing stack entrance, in

<u>Dimensionless Groupings</u>

A* - Secondary flow area to primary flow area ratio

K_e - Kinetic energy correction factor



K_m - Momentum correction factor at the mixing stack exit

K_p - Momentum correction factor at the primary nozzle exit

M - Mach number

ΔP* - Pressure coefficient

Re - Reynolds number

W* - Secondary mass flow rate to primary mass flow rate ratio

ρ* - Secondary flow density to primary flow density ratio

Greek Letter Symbols

μ - Absolute viscosity, lbf-şec/ft²

ρ - Density, lbm/ft³

 $\beta - K_m + \frac{f}{2} A_w / A_m$

Subscripts

O - Section within secondary air plenum

- Section at primary nozzle exit

2 - Section at mixing stack exit

B - Burner

m - Mixed flow or mixing stack

P - Primary

s - Secondary

u - Uptake

w - Mixing stack inside wall



Tabulated Values

DELPN, PN - Pressure drop across entrance transition nozzle, in H₂O

FHZ - Fuel flow meter reading, Hz

P* - Pressure coefficient

PA, B - Ambient pressure, in Hg

PA-PS, ΔPS - Pressure differential across secondary

flow nozzles, in H₂O

PMIX, PMS - Mixing stack static pressure, in H₂O

PNH - Static pressure upstream of entrance

transition nozzle, in Hg

PU-PA - Uptake static pressure, in H₂O

P*/T* - Dimensionless pressure coefficient

T* - Absolute temperature ratio, secondary

flow to primary flow

TAMB - Ambient temperature, °F

TMIX - Mixing stack wall temperature, °F

TUPT - Uptake temperature, °F

UM - Average velocity in mixing stack, ft/sec

UP - Primary flow velocity at nozzle exit, ft/sec

UU - Primary flow velocity in uptake, ft/sec

WP - Primary mass flow rate, lbm/sec

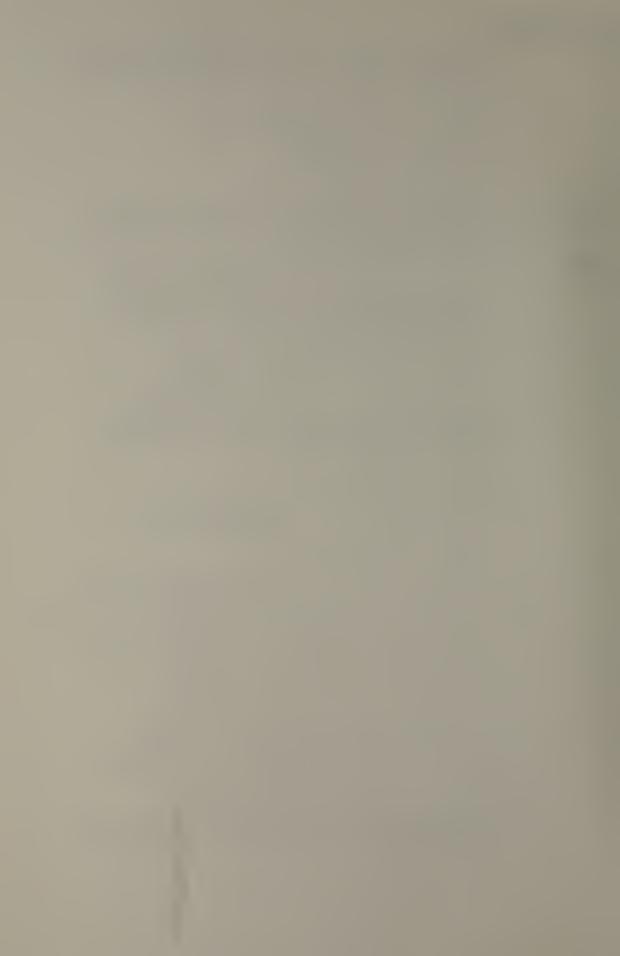
WS - Secondary mass flow rate, lbm/sec

WPA - Mass flow rate of primary air, lbm/sec

WPF - Mass flow rate of fuel, lbm/sec

W* - Secondary mass flow rate to primary flow

rate ratio



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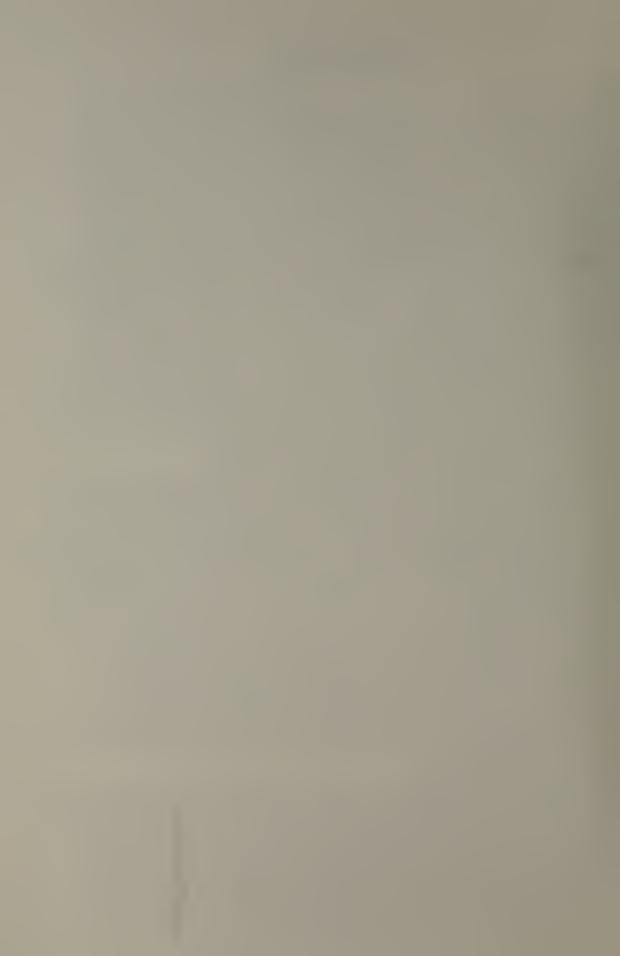


I. INTRODUCTION

The gas turbine engine has become the prime mover of choice for recent naval applications. One of the unique features of gas turbine engines is their hot and voluminous exhaust. This presents problems such as overheating of antennae and other equipment by exhaust plume impingement and the creation of an undesirable infra-red signature of the hot exhaust plume. An effective means of reducing the exhaust gas temperature is to mix it with ambient air prior to its discharge from the stack. Exhaust gas eductor systems presently in service have demonstrated their effectiveness in cooling by such a mixing process.

The subject of this investigation is the application of multiple nozzle eductor systems for cooling the exhaust gas from gas turbine powered ships. This research is an extension of work reported by Lt. C. R. Ellin [1], Lt. C. P. Staehli and Lt. R. J. Lemke [2], Lt. D. R. Welch [3], and Lt. C. M. Moss [4]. The scope of the work reported here includes verification of some of the results reported by Welch [3], and hot flow testing of two systems initially investigated by Staehli and Lemke [2].

The exhaust gas eductor system, illustrated schematically in Figure 1, is defined as the portion of the uptake which discharges the exhaust gas through nozzles into a mixing stack. The purpose of the eductor system is to induce a



flow of cool ambient air which is mixed with the hot exhaust gas in order to lower the temperature of the exhaust stack and exhaust plume. These gas eductors must meet three major requirements. They must pump large amounts of secondary (cooling) air into the mixing stack, they must adequately mix the hot high velocity exhaust gas and the cool low velocity secondary air, and they must not adversely affect the gas turbine's performance.

A one-dimensional flow analysis of a simple single nozzle eductor system, as a unit, facilitates determination of the nondimensional parameters which govern the flow phenomenon.

An experimental correlation of these nondimensional parameters has been developed and is used to evaluate eductor performance.

The geometric parameters which influence the gas eductor's performance include the number and size of primary nozzles, the length of the mixing stack, the ratio of the primary nozzle flow area to the mixing stack area, the ratio of the length of the mixing stack to its diameter, and the distance from the primary nozzles to the mixing stack. Numerous combinations of and variations in these parameters have been investigated and reported in References [1] through [4].

The intent of this investigation was to obtain data using hot flow testing of gas eductor systems to establish the effect of uptake gas temperature on the eductor's performance. Temperature data is unavailable from cold flow testing; correlation of hot flow data with previous cold flow data



allows a validation of the hot gas generator and a validation of the use of cold flow models for hot flow prototypes.

Two exhaust eductor models were tested. Both geometries were tested previously using cold flow facilities, by Staehli and Lemke [2]. Tests were made over a range of temperatures, but retained the same flow parametric values.

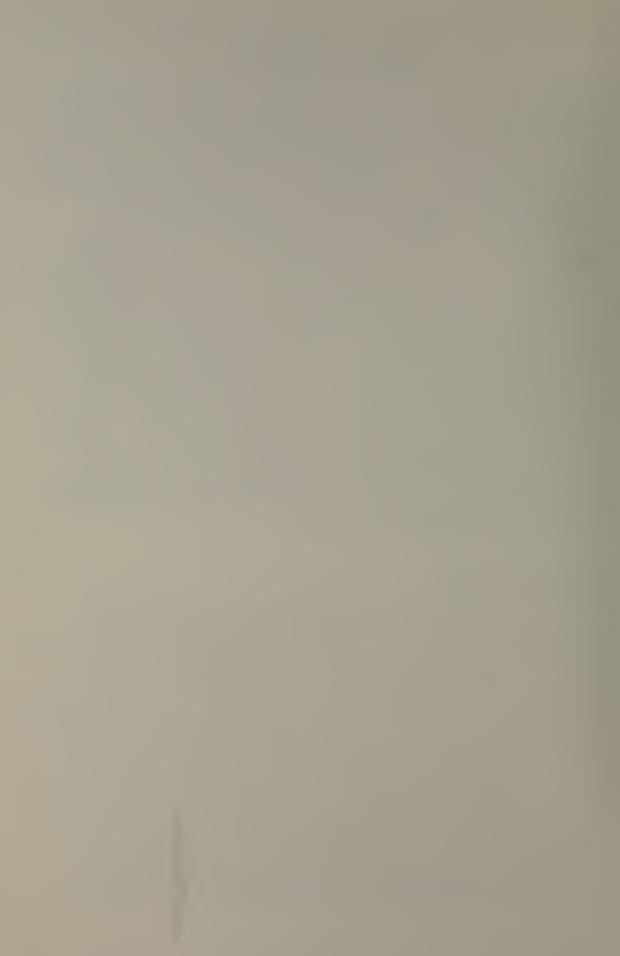


II. THEORY AND ANALYSIS

Evaluation of the effects of eductor geometry on prototype eductor performance through experimentation with models
requires the following: assurance of similtude between model
and prototype; the identification of the dimensionless
groupings pertinent to the flow phenomenon; and a suitable
means of data analysis and presentation. Dynamic similarity
was maintained by using Mach number similarity to establish
the model's primary flow rate. Determination of the dimensionless groupings that govern the flow was accomplished
through the analysis of a simple air eductor system. Based
on this analysis, an experimental correlation of the nondimensional parameters was developed and used in presenting
and evaluating experimental results.

A. MODELING TECHNIQUE

For the flow velocities considered, the primary flow through the model eductor is turbulent (Reynolds number based on diameter of approximately 10⁵). Consequently, turbulent momentum exchange outweighs shear interaction, and the kinetic and internal energy terms influence the flow more than viscous forces. Since Mach number can be shown to represent the square root of the ratio of kinetic energy of a flow to its internal energy, it is a more significant parameter than Reynolds number in describing the primary flow through the uptake.



Mach number similarity was therefore used to model the primary flow. Mach number is defined as the ratio of flow velocity to sonic velocity in the medium considered. For a perfect gas, sonic velocity, c, is calculated

$$c = (g_c^{kRT})^{0.5}$$

The prototype Mach number is .064.

The geometric scale factor was influenced by test facility flow capabilities, primary flow velocities and availability of modeling materials.

B. ONE-DIMENSIONAL ANALYSIS OF A SIMPLE EDUCTOR

The theoretical analysis of an eductor may proceed in two ways. One method attempts to analyze the details of the mixing process of the primary and secondary flows inside the mixing stack and thereby determines the parameters that describe the flow. This requires an interpretation of the mixing phenomenon, which when applied to multiple nozzle systems becomes extremely complex. The second method, employed in this study, analyzes the overall performance of the eductor system as a unit. Since details of the mixing process are not considered in this method, an analysis of the simple single nozzle eductor system shown in Figure 2 leads to a determination of the dimensionless groupings governing the flow. The following one dimensional analysis is from Ellin [1].

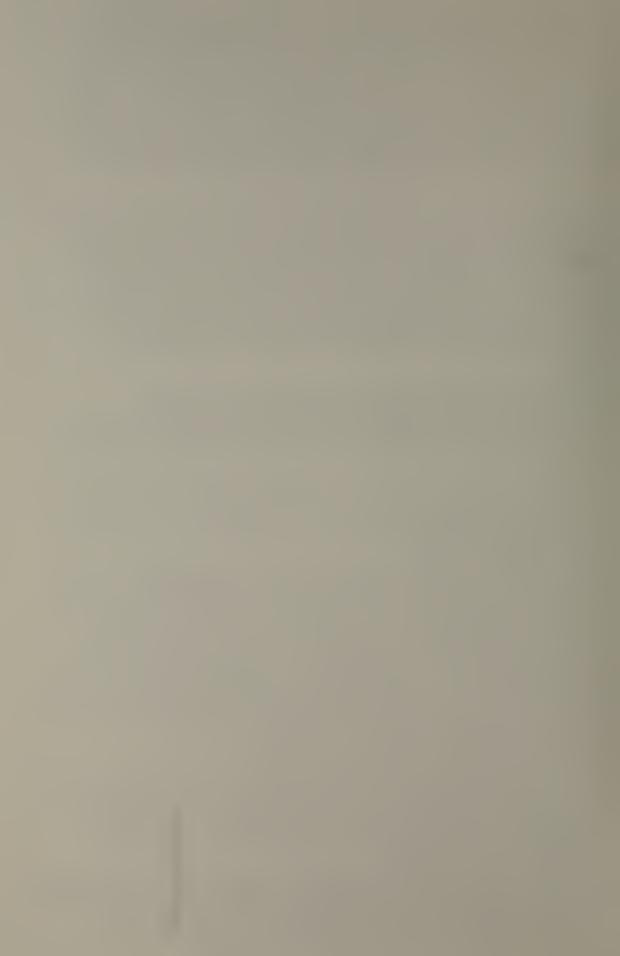


The primary fluid, flowing at a rate W_p and velocity U_p , enters the constant area section of the mixing stack, inducing a secondary flow rate of W_s at velocity U_s . The primary and secondary flows are mixed and leave the mixing stack at a flow rate of W_m and a bulk average velocity of U_m .

The one-dimensional flow analysis of the simple eductor system described depends on the simultaneous solution of the equations of continuity, momentum, and energy with an appropriate equation of state and specified boundary conditions.

The following simplifying assumptions are made:

- Both flows are perfect gases with constant specific heats.
- Steady, incompressible flow throughout the eductor and plenum exists.
- 3. The flow throughout the eductor is adiabatic. The flow of secondary air from the plenum (at section 0) to the entrance of the mixing stack (at section 1) is isentropic. Irreversible adiabatic mixing occurs between the primary and secondary flows in the mixing stack (between sections 1 and 2).
- 4. The static pressure distributions across the entrance and exit planes of the mixing stack (at sections 1 and 2) are uniform.
- 5. At the mixing stack entrance (section 1), the primary flow velocity $\mathbf{U}_{\mathbf{p}}$ and temperature $\mathbf{T}_{\mathbf{p}}$ are uniform

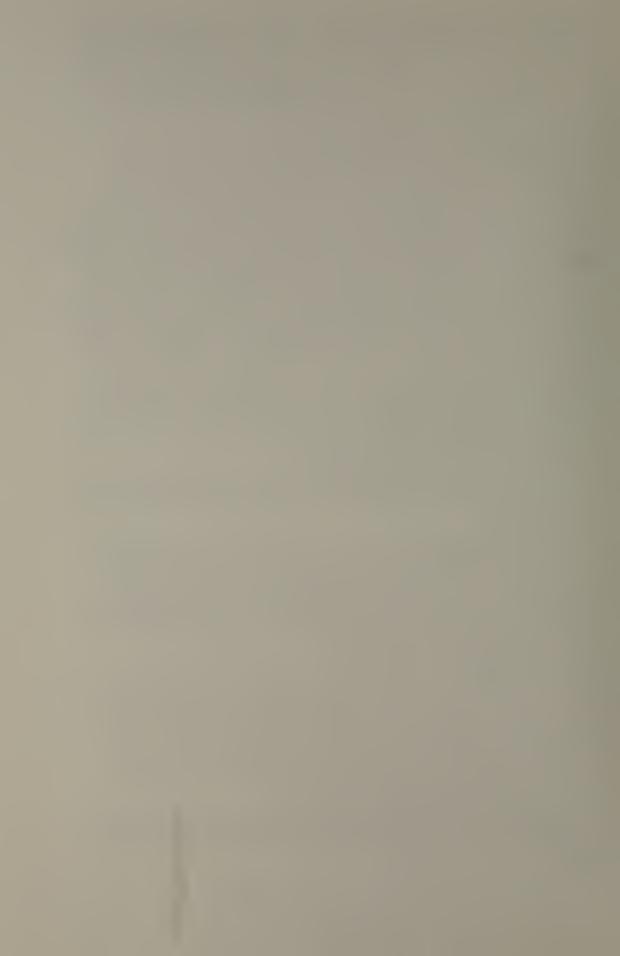


across the primary stream, and the secondary flow velocity $\mathbf{U_S}$ and temperature $\mathbf{T_S}$ are uniform across the secondary stream; but $\mathbf{U_p}$ does not equal $\mathbf{U_S}$, and $\mathbf{T_D}$ does not equal $\mathbf{T_S}$.

- 6. Incomplete mixing of the primary and secondary flows in the mixing stack is accounted for by the use of a non-dimensional momentum correction factor, K_m, which relates the actual momentum rate to the rate based on the bulk-average velocity and density and by the use of a non-dimensional kinetic energy correction factor, K_e, which relates the actual kinetic energy rate to the rate based on the bulk-average velocity and density.
- 7. Potential energy differences due to elevation are negligible.
- 8. Pressure changes Po to Pl and Pl to Pa are small relative to the static pressure so that the gas density is principally dependent upon temperature and atmospheric pressure.
- 9. Wall friction in the mixing stack is accounted for with the conventional pipe friction factor term based on the bulk-average flow velocity $\mathbf{U}_{\mathbf{m}}$ and the mixing stack wall area $\mathbf{A}_{\mathbf{w}}$.

The conservation of mass principle for steady state flow yields

$$W_{m} = W_{p} + W_{s} \tag{1}$$



where

$$W_{p} = \rho_{p} U_{p} A_{p}$$

$$W_{s} = \rho_{s} U_{s} A_{s}$$

$$W_{m} = \rho_{m} U_{m} A_{m}$$
(1a)

Substituting for W_{m} , the bulk-average velocity becomes

$$U_{\rm m} = \frac{W_{\rm S} + W_{\rm p}}{\rho_{\rm m} A_{\rm m}} \tag{1b}$$

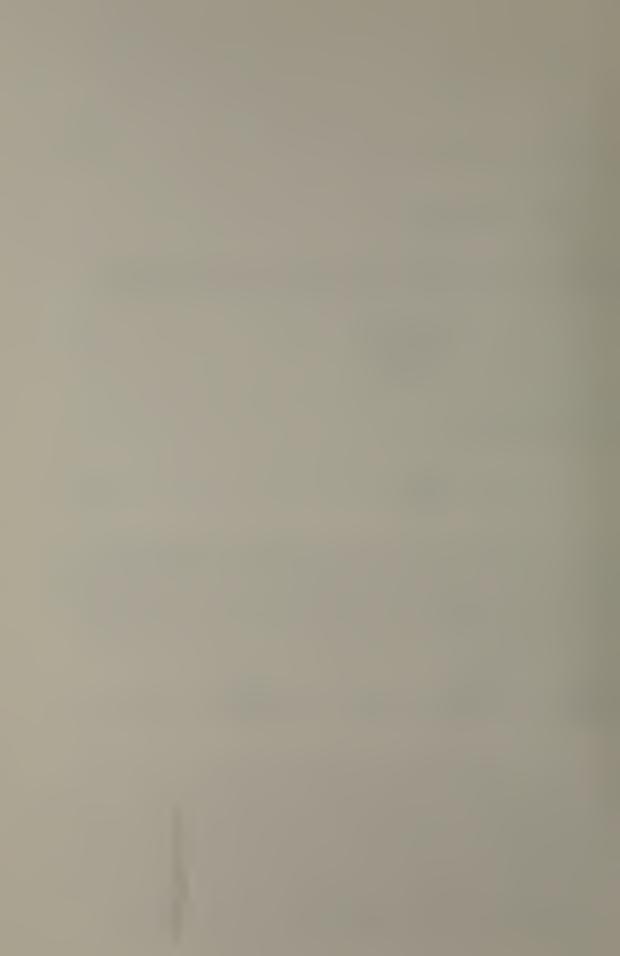
Now, from assumption 1

$$\rho_{\rm m} = \frac{P_{\rm a}}{R T_{\rm m}} \tag{2}$$

where $T_{\rm m}$ is calculated as the bulk-average temperature for the mixed flow. Applying assumptions 4 and 6, the momentum equation for the flow in the mixing stack may be written

$$K_{p}\left[\frac{W_{p}U_{p}}{g_{c}}\right] + \left[\frac{W_{s}U_{s}}{g_{c}}\right] + P_{1}A_{1} = K_{m}\left[\frac{W_{m}U_{m}}{g_{c}}\right]_{2} + P_{2}A_{2} + F_{fr}$$
(3)

with $A_1 = A_2$. The momentum correction factor K_p is introduced to account for a possible non-uniform velocity profile across the primary nozzle exit. It is defined in a manner similar to that of K_m and by assumption 5 is equal to unity but is included here for completeness. The momentum



correction factor for the mixing stack exit is defined by the relation

$$K_{\rm m} = \frac{1}{K_{\rm m} U_{\rm m}} \int_{0}^{A_{\rm m}} U_{2}^{2} \rho_{2} dA$$
 (4)

The actual variable velocity and a weighted average density at section 2 are used in the integrand. The wall skin-friction force F_{fr} can be related to the mean velocity by

$$F_{fr} = f A_{w} \left[\frac{U_{m}^{2} \rho_{m}}{2 g_{c}} \right]$$
 (5)

For turbulent flow, the friction factor may be calculated from the Reynolds number as

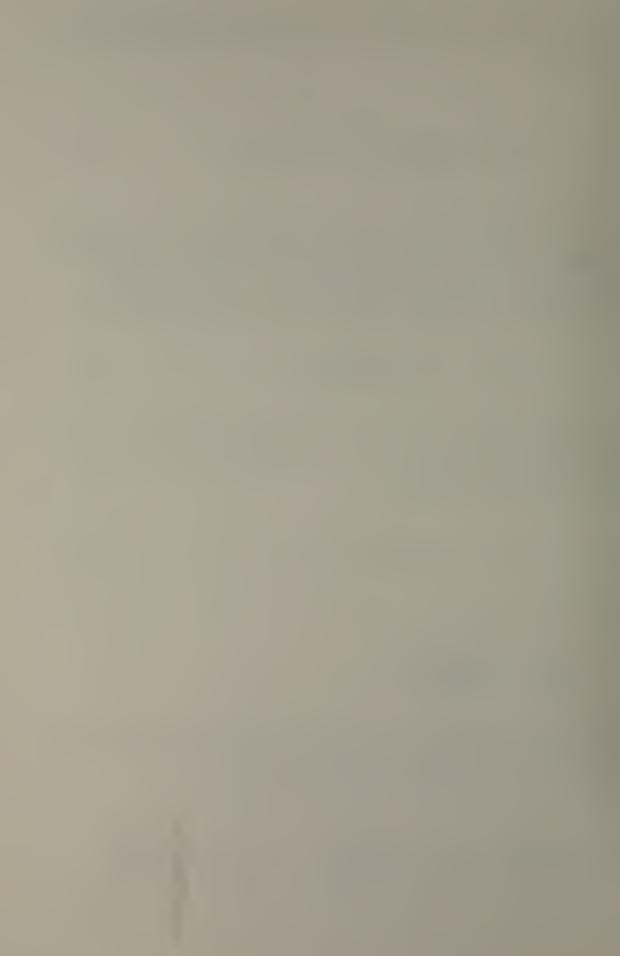
$$f = 0.046 (Re_{m})^{-0.2}$$
 (6)

where

$$Re_{m} = \frac{\rho_{m} U_{m} D_{m}}{\mu_{m}}$$

Applying the conservation of energy principle to the steady flow in the mixing stack with assumption 7

$$W_{p} [h_{p} + \frac{U_{p}^{2}}{2g_{c}}] + W_{s} [h_{s} + \frac{U_{s}^{2}}{2g_{c}}] = W_{m} [h_{m} + K_{e} \frac{U_{m}^{2}}{2g_{c}}]$$
(7)



where K_{e} is the kinetic energy correction factor defined by the relation

$$\kappa_{e} = \frac{1}{W_{m} U_{m}^{2}} \int_{0}^{A_{m}} U_{2}^{3} \rho_{2} dA$$
 (8)

It may be demonstrated that for the purpose of evaluating the mixed mean flow temperature $\mathbf{T}_{\mathbf{m}}$, the kinetic energy terms may be neglected to yield

$$h_{m} = \frac{W_{p}}{W_{m}} h_{p} + \frac{W_{s}}{W_{m}} h_{s}$$
 (9)

where $T_m = F(h_m)$ only, from assumption 1.

The energy equation applied to the flow of secondary air between the plenum entrance and the mixing stack entrance may be reduced to

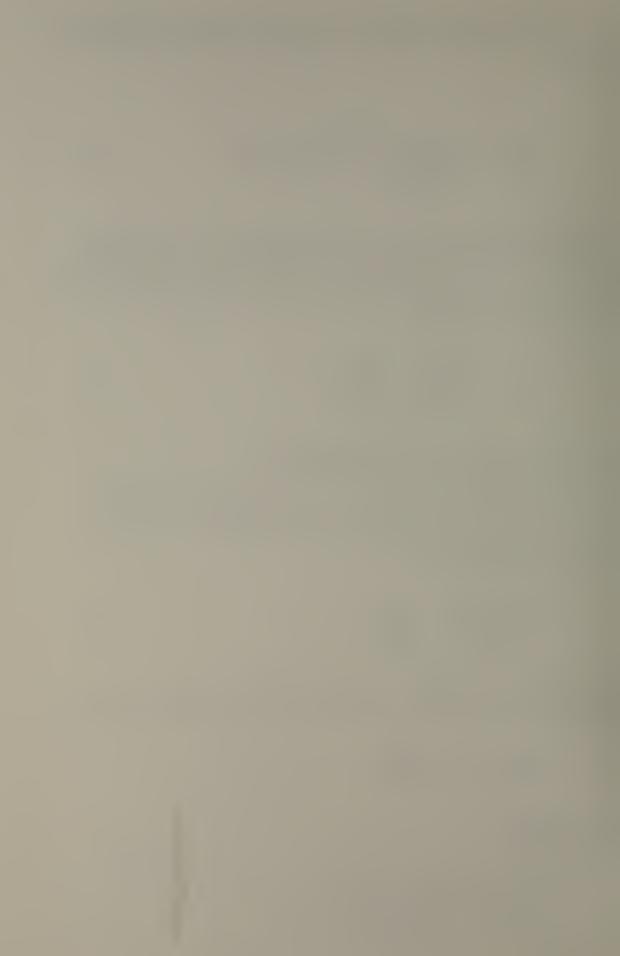
$$\frac{P_0 - P_1}{\rho_s} = \frac{U_s^2}{2g_c} \tag{10}$$

This comes from the steady, adiabatic flow, energy equation

$$dh = -d \left[\frac{U_s^2}{2} \right]$$

recognizing that

$$T ds = dh - \frac{1}{\rho} dP = 0$$



for the postulated isentropic conditions. Thus

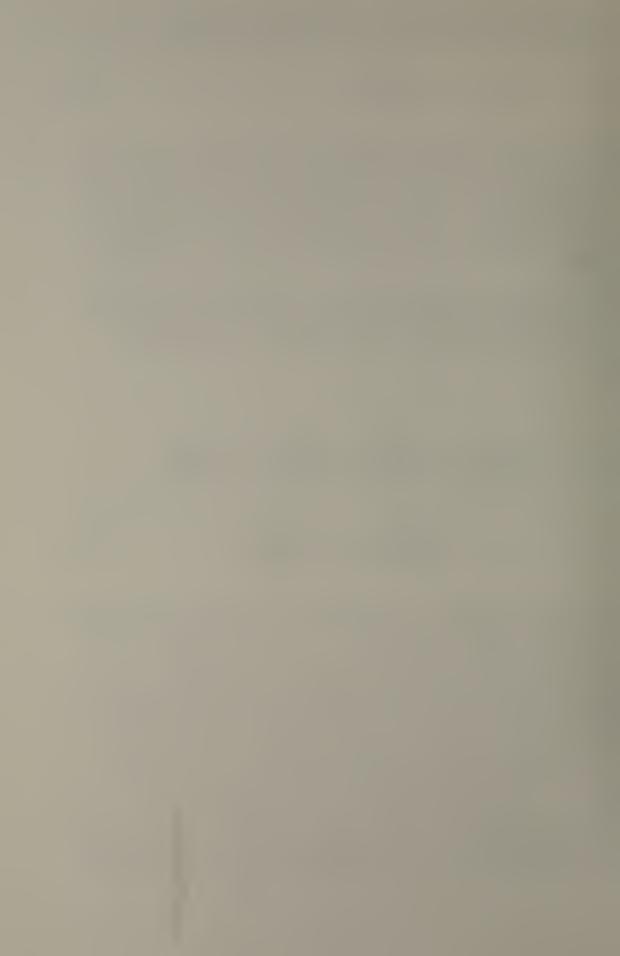
$$\frac{dP}{\rho} = -d \left[\frac{U_s^2}{2} \right] \tag{10a}$$

Pressure changes from the plenum to the mixing stack are small (assumption 8) and the temperature and density are relatively constant, and thus equation (10) is readily obtained.

The foregoing equations may be combined to yield the partial vacuum produced by the eductor in the plenum chamber

$$P_{a} - P_{o} = \frac{1}{2g_{c} A_{m}} \left\{ K_{p} \frac{W_{p}^{2}}{A_{p} \rho_{p}} + \frac{W_{s}^{2}}{A_{s} \rho_{s}} \left[1 - \frac{A_{m}}{2 A_{s}} \right] - \frac{W_{m}^{2}}{A_{m} \rho_{m}} \left[K_{m} + \frac{f}{2} \frac{A_{w}}{A_{m}} \right] \right\}$$
(11)

where A_p and ρ_p apply to the primary flow at the entrance to the mixing stack (section 1), A_s and ρ_s apply to the secondary flow at this same section, and A_m and ρ_m apply to the mixed flow at the exit of the mixing stack (section 2). P_a is atmospheric pressure and is equal to the pressure at the exit of the mixing stack P_2 . This equation also incorporates the assumption that $(\rho_s)_1 = (\rho_s)_0$ so that ρ_s may be taken as the density of the secondary flow in the plenum.



C. NONDIMENSIONAL SOLUTION OF SIMPLE EDUCTOR ANALYSIS

Normalizing equation (11) leads to the following nondimensional terms:

$$\Delta P^* = \frac{\frac{P_a - P_0}{\rho_s}}{\frac{U_p^2}{2 g_c}}$$

a pressure coefficient which compares the "pumped head" $\frac{P_a - P_0}{\rho_s}$ for the secondary flow to the "driving head" $\frac{U_p^2}{2 g_c}$ of the primary flow.

$$W^* = \frac{W_s}{W_p}$$

a flow rate ratio, secondary-toprimary mass flow rate.

$$T^* = \frac{T_s}{T_p}$$

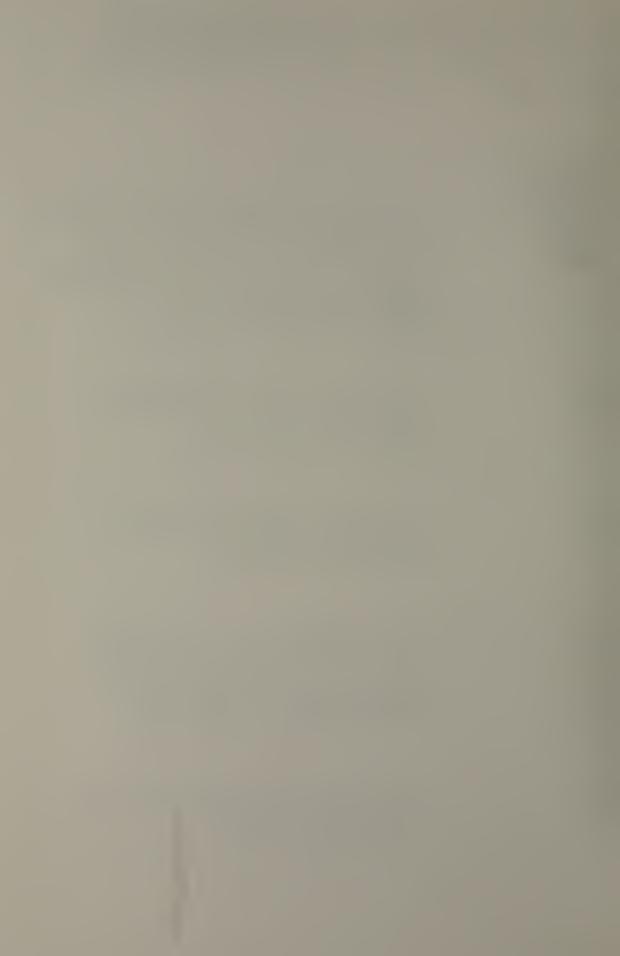
an absolute temperature ratio, secondary-to-primary.

$$\rho^* = \frac{\rho_s}{\rho_p}$$

a flow density ratio. Note that since $P_s = P_p$ and the fluids are perfect gases, $\rho^* = \frac{T}{T_s} = \frac{1}{T^*}$.

$$A^* = \frac{A_s}{A_p}$$

area ratio of secondary flow area to primary flow area



 $\frac{A_p}{A_m}$

area ratio of primary flow area to mixing stack cross sectional area

 $\frac{A_{W}}{A_{m}}$

area ratio of wall friction area to mixing stack cross sectional area

Kp

momentum correction factor for primary flow

 $_{\rm m}^{\rm K}$

momentum correction factor for mixed flow

f

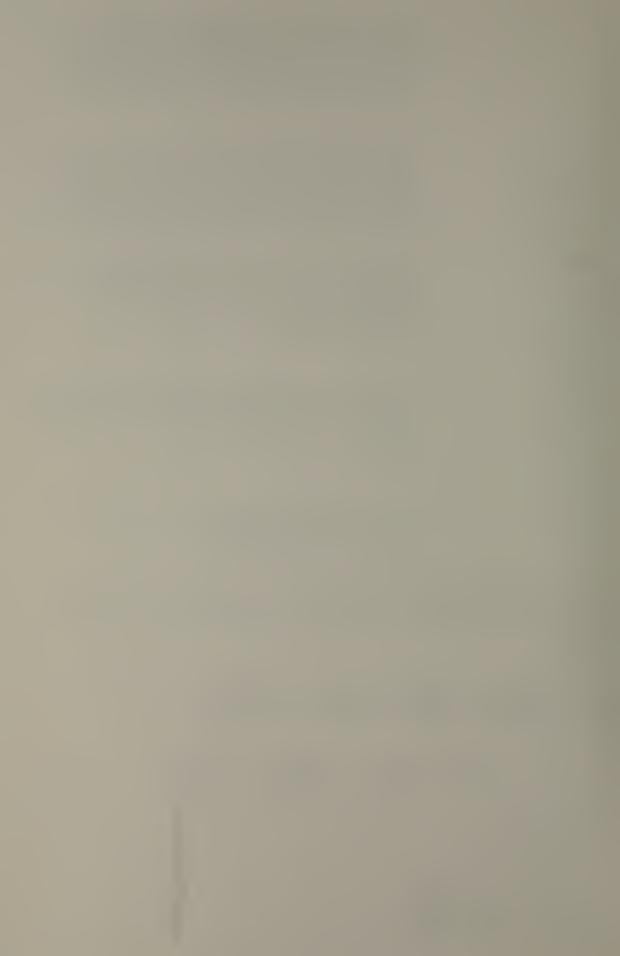
wall friction factor

With these non-dimensional groupings, equation (11) may be written as

$$\frac{\Delta P^*}{T^*} = 2 \frac{A_p}{A_m} \{ [K_p - \frac{A_p}{A_m} \beta] - W^* (1 + T^*) \frac{A_p}{A_m} \beta + W^* T^* [\frac{1}{A^*} (1 - \frac{A_m}{2A^* A_p}) \beta - \frac{A_p}{A_m} \beta] \}$$
 (11a)

where

$$\beta = K_m + \frac{f}{2} \frac{A_w}{A_m}.$$



For a given eductor geometry, equation (11a) may be expressed in the form

$$\frac{\Delta P^*}{T^*} = C_1 + C_2 W^*(T^* + 1) + C_3 W^{*2} T^*$$
 (11b)

where

$$C_{1} = 2 \frac{A_{p}}{A_{m}} (K_{p} - \frac{A_{p}}{A_{m}} \beta)$$

$$C_{2} = -2 (\frac{A_{p}}{A_{m}})^{2} \beta \qquad (11c)$$

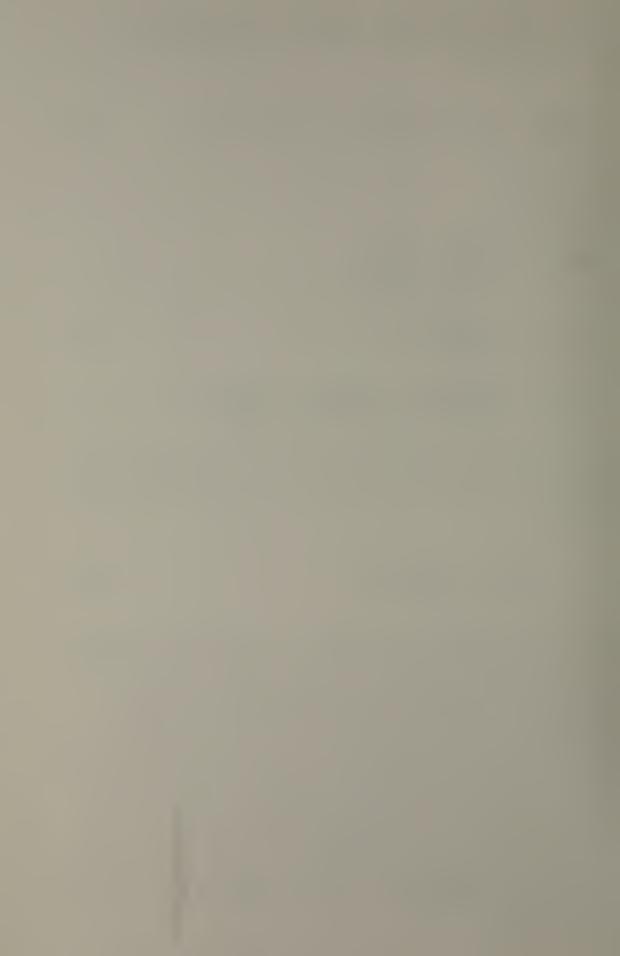
$$C_{3} = 2 \frac{A_{p}}{A_{m}} \{ \frac{1}{A^{*}} (1 - \frac{A_{m}}{2 A^{*} A_{p}}) \beta - \frac{A_{p}}{A_{m}} \beta \}$$

Equation (11b) may be expressed as a simple functional relationship

$$\Delta P^* = F(W^*, T^*) \tag{12}$$

This same relationship results from a dimensional analysis of the mixing process within the mixing stack (Ellin [1]).

Two geometric dimensionless quantities were added to this investigation. The distance, S, from the primary flow nozzle exit to the mixing stack entrance and the distance, x, from the entrance to the mixing stack, normalized with respect to the mixing stack diameter, D, were also defined as nondimensional quantities. The two additional quantities are listed below:



 $\frac{\mathbf{x}}{\mathbf{D}}$

ratio of the axial distance from the mixing stack entrance to the diameter of the mixing stack.

S

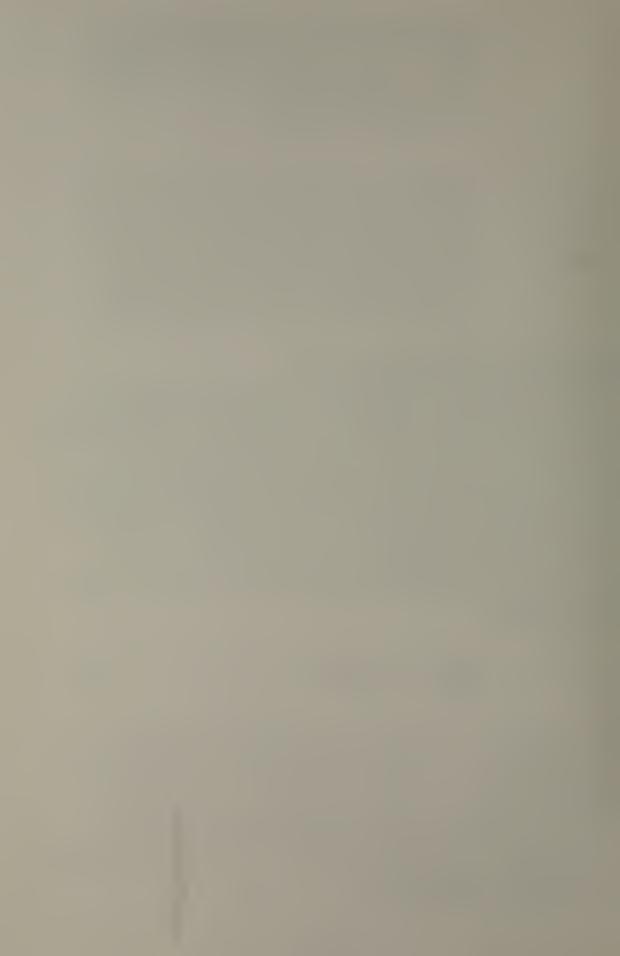
standoff; the ratio of the axial distance between the primary nozzle exit plane and the mixing stack entrance to the diameter of the mixing stack.

D. CORRELATION OF EXPERIMENTAL DATA

In the experimental apparatus, a given Mach number can be achieved over a wide variation in pressures, temperatures, and flow rates. Accordingly a means of presenting the experimental data was developed which is pseudo-independent of the dimensionless groupings ΔP^* , T^* , and W^* . From equation (11b), a satisfactory correlation of P^* , T^* , and W^* takes the form

$$\frac{\Delta P^*}{T^*} = F(W^*T^*) \tag{13}$$

where the exponent n has been experimentally determined to be 0.44 (Appendix B). $\Delta P^*/T^*$ is plotted as a function of W*T* $^{(0.44)}$ to yield an eductor's pumping characteristic curve. For ease of discussion, W*T* $^{(0.44)}$ will be referred to as the pumping coefficient.



III. EXPERIMENTAL APPARATUS

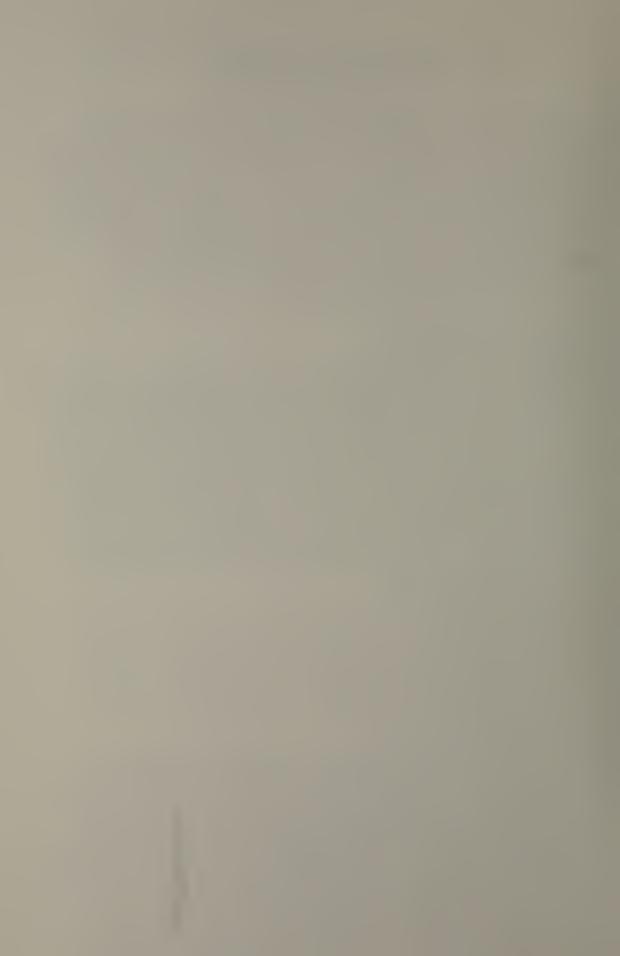
Hot primary gas is supplied to the nozzle and mixing stack system by the combustion gas generator and associated ducting illustrated in Figures 3 and 4. The eductor system under test is mounted in a secondary air plenum. ASME long radius flow nozzles mounted in the plenum walls allow measurement of the secondary air flow.

A. COMBUSTION GAS GENERATOR

The input air to the combustion gas generator is supplied by a Carrier model 18P350 centrifugal air compressor. The compressor is located in an adjacent building and the input air is piped underground to an eight inch inside diameter (ID) horizontal pipe with a butterfly shutoff valve and a globe bypass valve. All air demands for this testing can be met with the bypass valve.

An entrance transition nozzle mates the eight inch ID compressor discharge piping with the four inch ID system piping. The pressure drop across this nozzle is used to measure the primary air flow.

Under control of the operator, a portion of the input air, the bypass air, travels straight through to the exhaust stack while the remainder passes through the U-bend piping to the combustion section. The combustion section includes the burner can and igniter assembly from a Boeing model 502-6A gas turbine engine. Certain fuel system components



from this engine were also utilized. The fuel system is shown schematically in Figure 5 and pictured in Figure 6.

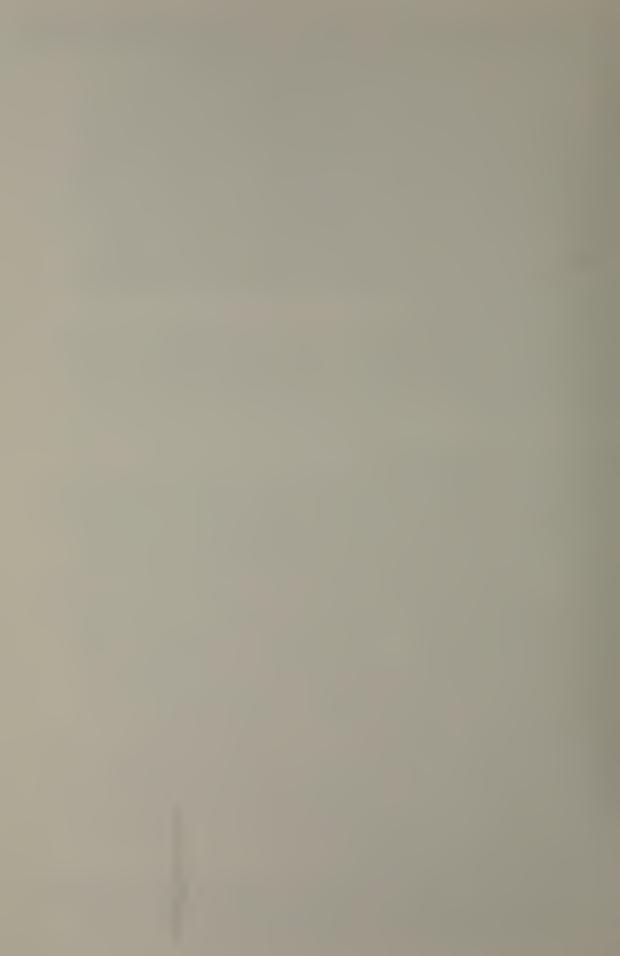
After the air is heated in the combustion section, it is mixed with the cooler air after both pass through the turbine nozzle box containing the bypass air mixer. The exhaust stack temperature is controlled by the ratio of bypass air to combustion air, and by fuel supply to the burner. The procedure for system light-off and operation is included in Appendix A.

The hot gas passes through a flow straightening section and then up the exhaust stack to the primary nozzles and the eductor system.

B. EDUCTOR AIR METERING BOX

Secondary air flow is measured with a large metering box which encloses the entire eductor assembly and acts as an air plenum. A set of standard ASME long radius flow nozzles of varying cross-sectional areas are mounted in the metering box away from the eductor. The metering box design allows a full range of alignment motions as well as a variety of mixing stack sizes, configurations, and placements. The metering box general arrangement is pictured in Figure 7 and a dimensional layout for a typical mixing stack installation is given in Figure 8. The interior of the air metering box is pictured in Figures 9 and 10.

For flexibility, the secondary air flow measuring system utilizes three different flow nozzle sizes: four of four



inch throat diameter, three of two inch diameter and three of one and one-half inch throat diameter; various combinations produce a wide variety of secondary cross-sectional flow areas.

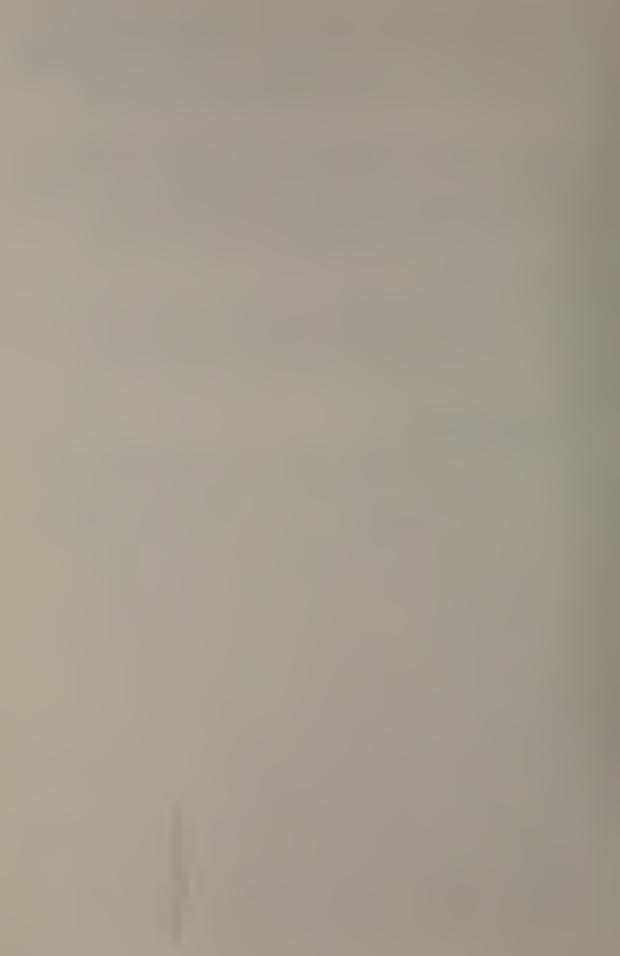
No attempt was made to measure air flow rates through the stack film cooling slots or through the diffuser ring. Staehli and Lemke [2] made such measurements in a cold flow test.

C. THE EDUCTOR SYSTEM

The eductor system includes the eductor nozzles and the mixing stack. Figure 1 shows the general eductor system arrangement.

1. The Mixing Stack

Two mixing stacks were tested, both constructed from 7.5 inch OD, 7.122 inch ID steel pipe. Referenced to the ID, the first was 2.5 diameters long (17.805 inches) and was tested to verify earlier experimental data and to gain operational familiarity with the equipment. The second stack was 1.75 diameters long (12.464 inches) with the wall pierced by six rings of angled cooling slots. This stack was shrouded, with a one- or two-ring diffuser added. The diffuser half-angle and ID were held constant, and the total mixing length was maintained at 2.5 diameters. The dimensional layout of this stack is shown in Figures 11 and 12 and is pictured in Figure 13. The stack with shroud and one diffuser ring is shown in Figures 14 and 15; the stack with shroud and two diffuser rings is shown in Figures 16 and 17. The



mixing stack inlet edge was rounded, and the stack was supported inside the secondary air plenum by an adjustable saddle.

2. Eductor Nozzles

Welch [3] had found a satisfactory nozzle geometry to consist of four nozzles, with a ratio of total nozzle cross-sectional area to mixing stack cross sectional area of 2.5. This nozzle system was used here. It is shown schematically in Figures 18 and 19 and pictured in Figures 20 and 21. The nozzle entrances were rounded.

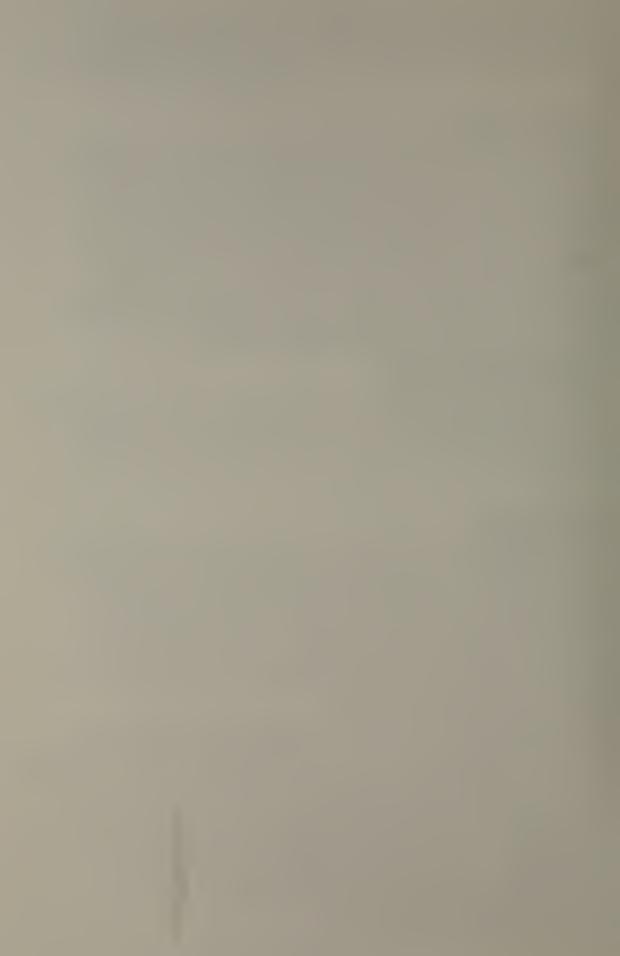
3. Standoff Ratio (S/D)

All tests were made at an S/D ratio of 0.5. Previous testing [4] has shown this to be approximately the optimum standoff ratio.

D. INSTRUMENTATION

The performance of an eductor is calculated from pressure and temperature data. Necessary measurements include the primary mass flow rate (fuel and air), the secondary mass flow rate, the uptake stack Mach number, and the mixing stack temperature and pressure profiles.

Several manometers are used to obtain the pressure and pressure drop measurements—a six inch inclined water manometer, two 20 inch upright water manometers, and a 20 inch upright mercury manometer. Atmospheric pressure is measured with a mercury barometer. The pressure measurement system is schematically shown in Figure 22.



Temperature measurements are made with either copperconstantan or chromel-alumel thermocouples wired to Newport
model 267A digital pyrometers. The pyrometers are capable
of monitoring 18 inputs each through barrel selector switches.
Ambient air temperature was measured with a mercury-in-glass
thermometer. A schematic of the temperature measurement
system is shown in Figure 23.

Fuel flow measurement is made with a Cox Instrument model V40-A vortex flowmeter coupled to an Andadex Instruments model CPM 603 frequency counter. Ross [5] performed the calibration of fuel flow rate versus frequency, and this curve is shown in Figure 24.

The calculation of the primary air mass flow rate requires the measurement of the inlet absolute pressure to the entrance nozzle (PNH), the pressure drop across this nozzle (DELPN), and the inlet air temperature. Calibration data of mass flow rate versus these parameters was obtained by Ross [5] and the curve is shown in Figure 25.

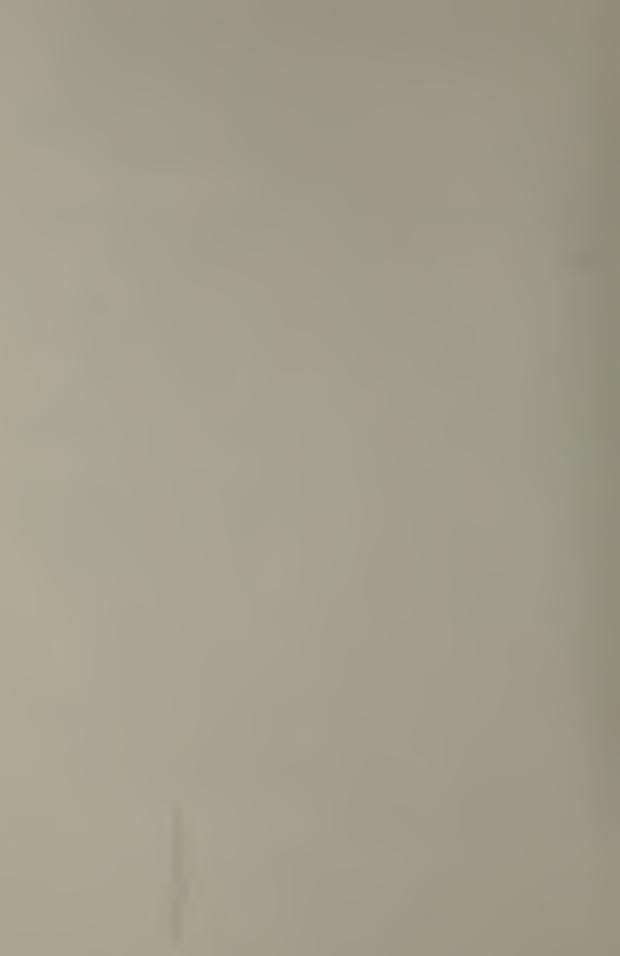
The calculation of the secondary air mass flow rate requires the measurement of the ambient pressure and temperature, the pressure drop across the secondary air nozzles (PA-PS), and the total nozzle cross-sectional area. Different combinations of nozzles are blocked or opened to control the mass flow rate.

The uptake stack Mach number depends on the uptake temperature and pressure, and the primary mass flow rate (air



and fuel). The uptake temperature (TUPT) is measured with a chromel-alumel thermocouple inserted through the primary nozzle plate at the centerline and protruding approximately two inches into the stack. Uptake pressure (PUP) is measured through a four-point averaging pressure tap located one diameter upstream of the primary nozzles.

Previously gathered experimental pressure data for solid wall mixing stacks were instrumental in designing the slotted wall mixing stack under test in this study. The wall, shroud, and ring temperatures were the focus of primary interest, and so pressure taps were not included although numerous thermocouples were fitted. Each ring of slots had two thermocouples -- one in line with a primary nozzle (position A) and one between two nozzles (position B). They were placed such that no slot with a thermocouple had any downstream interference, and such that the exit wires were evenly spaced around the circumference (Figure 26). The shrouds and rings were also instrumented with thermocouples, evenly spaced in sets of two (position A and position B) along the length. Other thermocouples were placed to allow proper operation of the gas generator and to allow calculations of the various Temperature profiles at the exit plane of the mixing stack were from a chromel-alumel thermocouple on an adjustable traversing mechanism.



IV. EXPERIMENTAL METHOD

As indicated in Chapter II the experimental system has been modeled with Mach number similarity. The Mach number in the model is achieved through a non-unique set of mass flow rates, temperatures, and pressures, which are then correlated in dimensionless form through the pumping coefficient, W*T* (0.44). The restrictive ASME flow nozzles used to measure secondary air flow depart from the protytype condition of essentially unimpeded air flow. To determine the pumping coefficient at the unimpeded operating point, the secondary air flow rate was incrementally varied from zero to its maximum measurable value. The pumping coefficient was computed at each point and plotted. (Especially when most of the secondary flow nozzles were blocked, hot exhaust gas was forced back into the plenum through the annular space between the diffuser rings. This unmeasured flow resulted in an understated pumping coefficient. After this effect was noted, the annular space was blocked during subsequent tests.) Extrapolation of the characteristic curve yielded the pumping coefficient for unimpeded secondary flow. Figure 27 is a typical characteristic curve. When extrapolating the curve, less weight was given to the more uncertain low pressure differences. The pumping coefficient at the operating point is used to compare different eductors.



After the data had been taken to determine the characteristic curve of the eductor, the plenum end plates and diffuser ring plugs were removed to simulate the 'open to the environment' condition. Temperature measurements on the mixing stack wall and on the shrouds and rings were then recorded. Two temperature profile traverses were made at the exit plane of the mixing stack. The horizontal traverse crossed two nozzles, the diagonal traverse went between the nozzles. Of interest is the maximum temperature and the overall flatness of the profile, which indicates the degree of mixing of the flows.

The eductor system performance was evaluated over the range of prototype uptake temperatures from 550 F to 850 F, in 100 degree intervals. For each model, the experimental series was run twice, once on each of two days. This was done to determine the reliability and repeatability of the data.



V. DISCUSSION OF EXPERIMENTAL RESULTS

The experimental apparatus was checked carefully prior to any model testing. Possible air leaks were plugged, and the range of alignment motions was increased. The FORTRAN data reduction program was rewritten and tailored for the addition of numerous temperature measurements.

A. SOLID WALL MIXING STACK

The first model testing was done with a solid wall mixing stack tested by Welch [3], for the purpose of verifying his data, verifying the data reduction program, and gaining operational familiarity with the equipment. Tests were made only at the endpoints of the temperature range--cold flow F. Results are plotted in Figure 28 and tabulated in Table II. At each temperature, the values of the pumping coefficient agreed within 2%. The value at the uptake temperature of 850 F was .53. Normalized mixing stack temperatures were not so close, but were within 10%. The maximum absolute value recorded was 370 F. Of significance is that a pressure depression below atmospheric in the mixing stack was confirmed with close agreement (less than 5% difference). This pressure distribution was the foundation for the slotted mixing stack design, which uses this pressure depression to draw film cooling air through the slots. Exit plane temperature profiles at 850 F showed a maximum temperature of 604 F at the centerline (Figure 33, Table V).



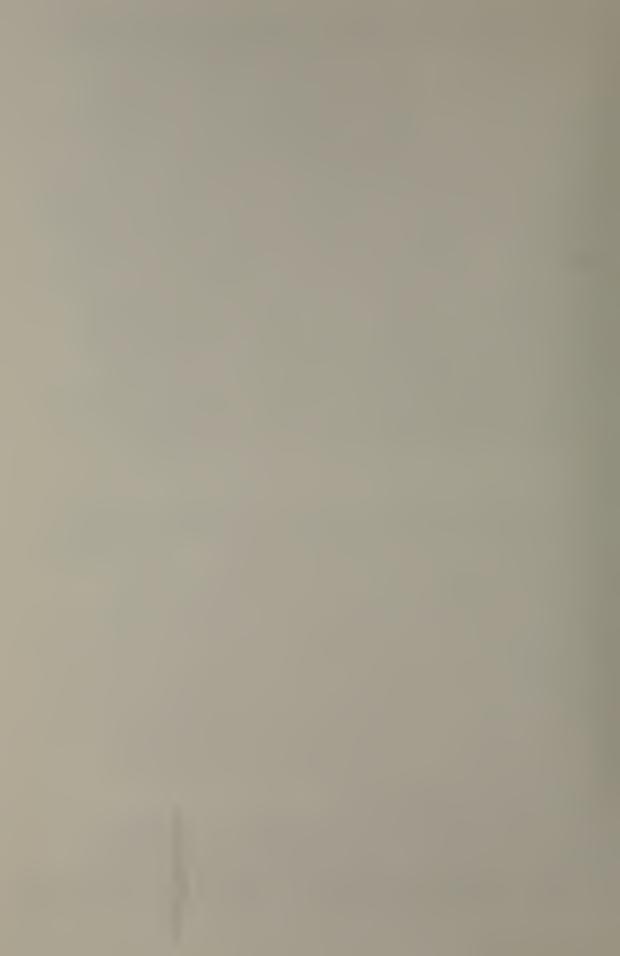
B. SLOTTED AND SHROUDED MIXING STACK WITH ONE DIFFUSER RING Temperatures were the primary data of interest in this study; temperature readings were taken on the mixing stack, the shroud, and the diffuser rings. All temperatures are plotted in Figure 31, and tabulated in Table III. Along the mixing stack, the temperatures in position A were greater than those in position B. This was expected since position A is the line of nozzle impingement. The temperatures also showed an increase along the length of the stack. The air drawn through the film cooling slots at the downstream end has had more preheating than the air drawn through the first slots, and there is less air induced because of the pressure recovery within the mixing stack. The maximum mixing stack temperature was 267 F, at an uptake temperature of 850 The shroud temperatures also exhibited an increase along the length which may be explained as above, but were the same for positions A and B. The temperatures were close to ambient at the shroud inlet, and the maximum recorded temperature was F at the downstream end when the uptake temperature was F. The diffuser ring temperatures showed a difference between position A and position B, but the latter was greater than the former. This result is minor, and unexplained. downstream temperatures were higher than the upstream temperatures, which are shielded by the shroud and have the benefit of fresh cooling air. The maximum diffuser ring temperature was 144 F, at an uptake temperature of 850 F. The downstream ring temperatures were about the same as the downstream shroud temperatures.



The pumping coefficient showed a general decrease with increasing temperature. This confirms a trend noted by Welch [3]. The pumping coefficient was .72 at an uptake temperature of 850 °F. Pumping coefficients are plotted in Figure 29(a) and 29(b), and tabulated in Table III. Repeatability of the results was within 1.5% as shown in Figure 29(c). Staehli and Lemke [2] tested a model with a ported mixing stack and a shroud merged into a diffuser ring. The results were similar to those of the slotted and shrouded mixing stack with one diffuser ring under discussion here. Their value for the pumping coefficient was .72 at cold flow. A direct comparison cannot be made because of differences in geometry; still the figures are in reasonable agreement.

The back pressure shows an increase with uptake temperature, ranging from 8.3 to 9.6 inches of water. This compares favorably with the range of 8.3 to 9.5 inches of water reported for the solid wall mixing stack tested by Welch [3]. This good agreement is to be expected, since for compressible flow the pressure ratio across a nozzle is fixed by the Mach number and area ratio. The geometry was identical and uptake conditions were similar, so the downstream pressure must agree between the two experiments.

The exit plane temperatures are plotted in Figure 34 and tabulated in Table VI. The curves are symmetric with no peaks, which indicates good mixing. The maximum temperatures



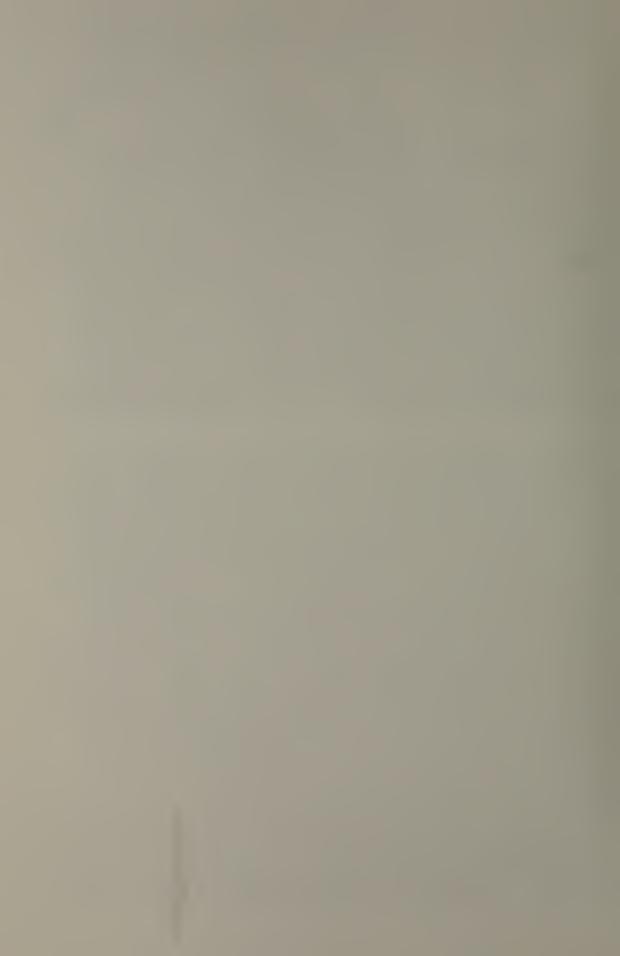
were recorded at the centerline, and were 400 F for an uptake temperature of 550 F and 570 F for an uptake temperature of 850 F.

SLOTTED AND SHROUDED MIXING STACK WITH TWO DIFFUSER RINGS C. Temperatures for this case are plotted in Figure tabulated in Table IV. As with one diffuser ring, mixing stack temperatures were higher along position A than position B, and increased with length. Even the highest mixing stack temperature was far below the corresponding temperature for a solid wall mixing stack. Temperature data recorded by Welch [3] for a solid wall mixing stack at an uptake temperature of 850 F are plotted with the temperatures obtained in this study in Figure 32(h); the slotted wall stack is everywhere at least 150 degrees F cooler than the solid wall mixing stack. The maximum mixing stack temperature recorded was 269 F for an uptake temperature of 850 F, essentially the same as for the one diffuser ring model. This indicates that the smaller annular space, .1875 inch versus .3125 inch for the stack with one ring, does not degrade the cooling capability of the film air flow. The shroud temperatures showed the same trends -- an increase with length but about 15 to 25 degrees F higher than for the one diffuser ring case. The maximum shroud temperature was 158 F at an uptake temperature of 850 F. The first ring yielded temperatures higher at the downstream end than at the upstream end, but no differences due to position A or B. The ring was significantly



cooler than for the one diffuser ring model; this may be explained because cooling air flows on both sides of the ring when a second ring is added. Maximum ring temperature recorded was 132 F at an uptake temperature of 850 F. The second ring temperatures were likewise not influenced by being at position A or B, and were much cooler than the downstream shroud temperatures. The second ring in the two ring diffuser, then, does not have the same temperatures as the ring in the one-ring diffuser; evidently the extra air flow past the first ring effectively shields the second ring from the hot gas flow. The maximum temperature recorded on the second diffuser ring was 134 F at an uptake temperature of 850 F.

The pumping coefficients decreased with increasing temperature. They are plotted in Figure 30(a) and 30(b), and tabulated in Table IV. The anomalous characteristic curve at uptake temperature 550 F (Figure 30(b)) is explained by noting the unusual operating pressures and pressure drops recorded for that run, which also resulted in a shift from one end of the allowed Mach number range to the other. The value of the pumping coefficient at an uptake temperature of 850 F was .74—this value is less than a 3% difference from the value reported for the stack with one diffuser ring; the difference is not considered significant. The repeatability of pumping coefficient measurements is within 1.5%, as shown in Figure 30(c). There is no corresponding cold flow model.



Although Staehli and Lemke [2] had a model with two rings, the first ring was analogous to the shroud used in this investigation and their model was compared to the stack with one diffuser ring. Nevertheless, they found very little difference in pumping coefficients between one- and two-ring diffuser models--the same conclusion reached here.

Uptake back pressure varies with plenum pressure as well as temperature. During tests with the two diffuser ring model, the annular spaces between the diffuser rings were not plugged and exhaust gas was drawn back into the plenum, thus raising the plenum pressure. This not only resulted in a less certain figure for the pumping coefficient, but also in a less certain figure for back pressure. With this warning in mind, the back pressure ranged from 8.4 to 10.0 inches of water. (Higher back pressure figures were recorded for run number one, 850 F (Table IV), but are considered uncertain. During this run the flow from the gas generator was surging, and uptake temperature was oscillating about the nominal 850 F. Temperature and pressure measurements were not recorded simultaneously, so the listed values do not necessarily reflect the same flow conditions.)

The exit plane temperatures are plotted in Figure 35, and tabulated in Table VII. As before, the curves are symmetric with no peaks, indicating well-mixed flow. The maximum temperatures recorded were 400 F at an uptake temperature of 550 F, and 580 F at an uptake temperature



of 850 F. These are the same maxima as recorded for the stack with one diffuser ring, and shows that the effects of adding a second ring are not felt at the flow centerline.



VI. CONCLUSIONS

This investigation studied the effects on the eductor temperature performance of adding film cooling slots, a mixing stack shroud, and a one- or two-ring diffuser. Detailed descriptions of these eductor systems are given in Section III above. Trends and comparisons between models tested and cold flow analogs were discussed in Section V. Only a review of the main conclusions resulting from this investigation are presented here. A summary of the temperatures, pumping coefficients, back pressures and exit plane temperatures is presented in Table I.

- A. Adding film cooling slots to a solid wall mixing stack significantly reduces mixing stack wall temperatures, from a maximum of 370 F to a maximum of 270 F in this study.
- B. Adding a shroud further reduces the external temperature of the mixing stack assembly, to a maximum of about 155 F. Further, this temperature is recorded only in the last one-quarter of the stack length; the preceding section is much cooler. The maximum shroud temperature is also reduced by increasing the annular gap between the shroud and the mixing stack.
- C. Adding one diffuser ring to the slotted and shrouded mixing stack covers the hot portion of the shroud, thus reducing the visible surface temperature by about 10



degrees F, and cuts in half the area at this temperature. Adding one diffuser ring improves the pumping coefficient by about 35%, a significant gain, but increases the back pressure from about 9.0 inches of water to about 9.4 inches of water. The maximum centerline exhaust gas temperature at the exit plane of the mixing stack is reduced from 605 °F for the solid wall mixing stack to 570 F. This reduction is probably due to the effects of film cooling air and air brought in through the shroud, rather than due to the diffuser ring.

D. Adding two diffuser rings to the slotted and shrouded mixing stack drops the maximum visible skin temperature of the mixing stack assembly to about 135 F. The pumping coefficient, back pressure, and maximum centerline exhaust gas discharge temperature are all unchanged from the values obtained from the stack with one diffuser ring.



VII. RECOMMENDATIONS

In addition to providing insight into the effects on temperatures that can be achieved, this study has generated an awareness of the investigation's shortcomings and sparked suggestions for further research.

- A. Investigate the optimum size and placement of film cooling slots. It appears that fewer slots could be used in the upstream portion of the stack without causing unacceptable temperature rise. This would slow the pressure recovery in the stack and allow more air to be induced through the downstream slots.
- B. Investigate the optimum diffuser angle, including the possibility of different spacing between the shroud and mixing stack than between the rings and shroud.
- C. Install a globe or needle valve in the fuel pump recirculation line for more precise and positive control of fuel flow.



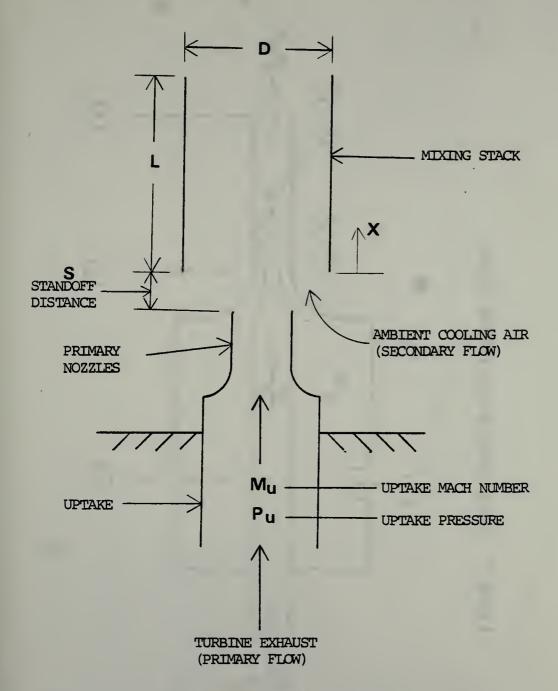
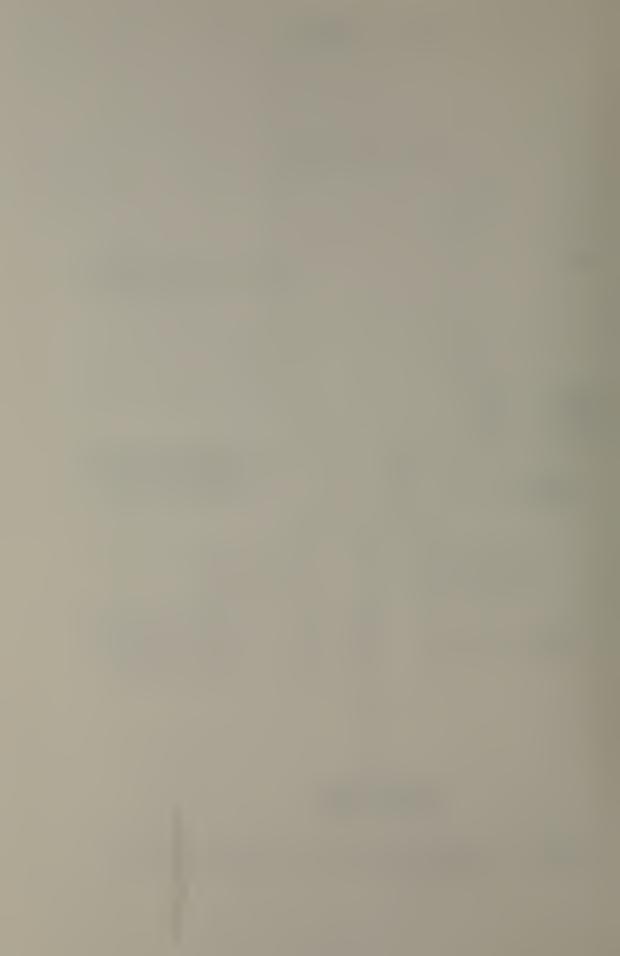


FIGURE 1. Schematic Diagram of Simple Exhaust
Gas Eductor



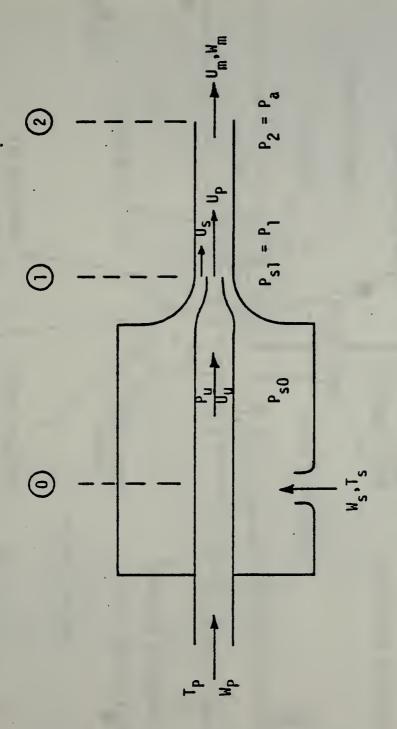
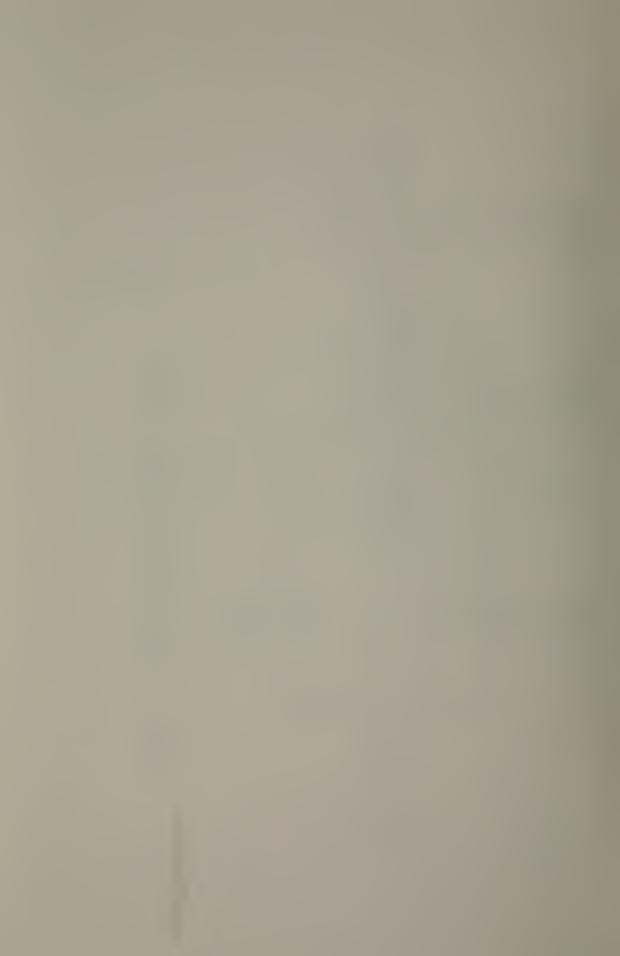
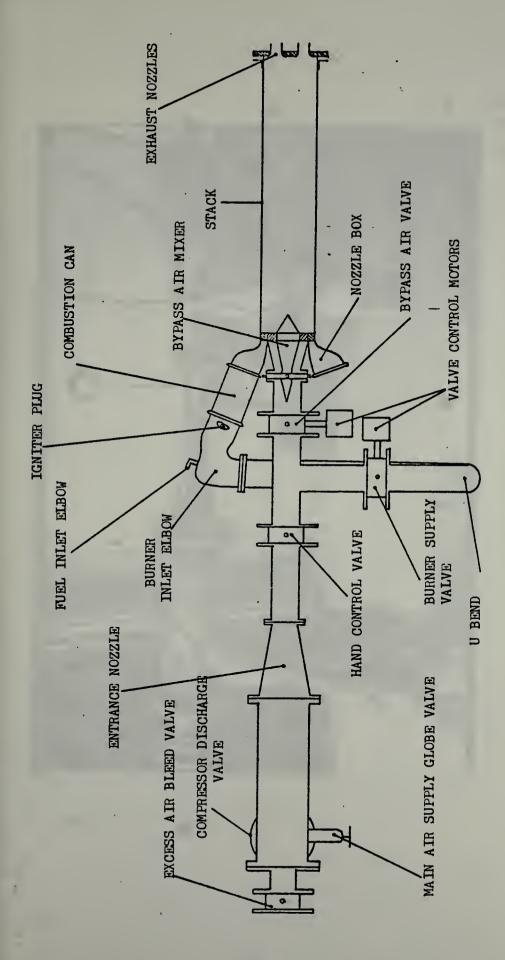


FIGURE 2. Simple Single Nozzle Eductor System.





Schematic Diagram of Combustion Gas Generator FIGURE 3.

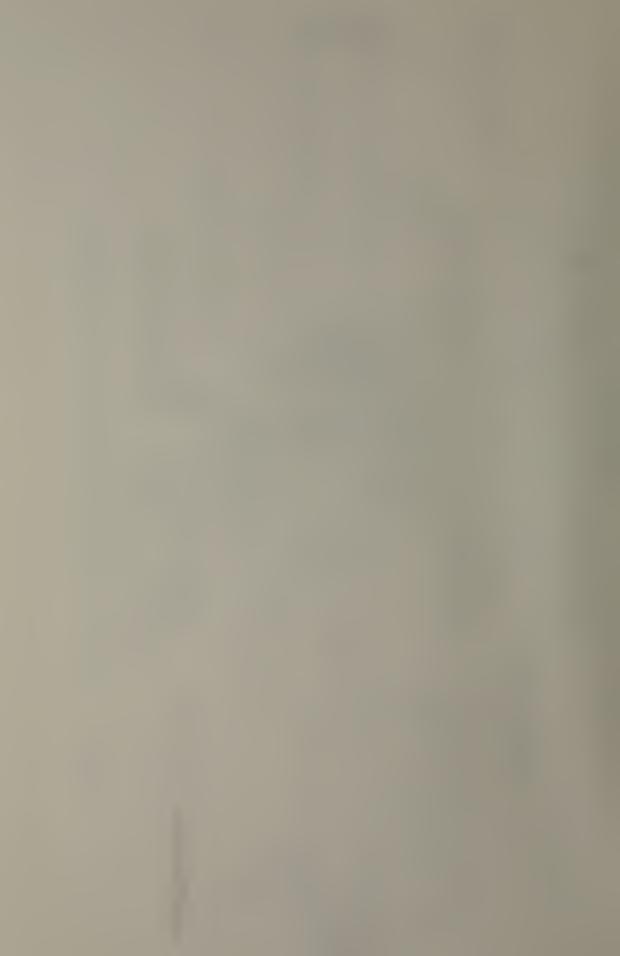


FIGURE 4. Combustion Gas Generator



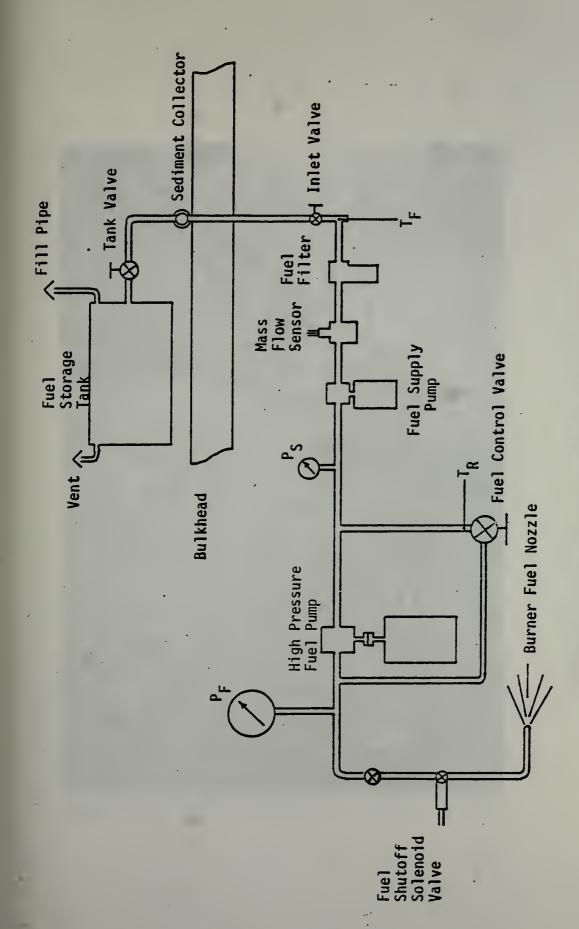
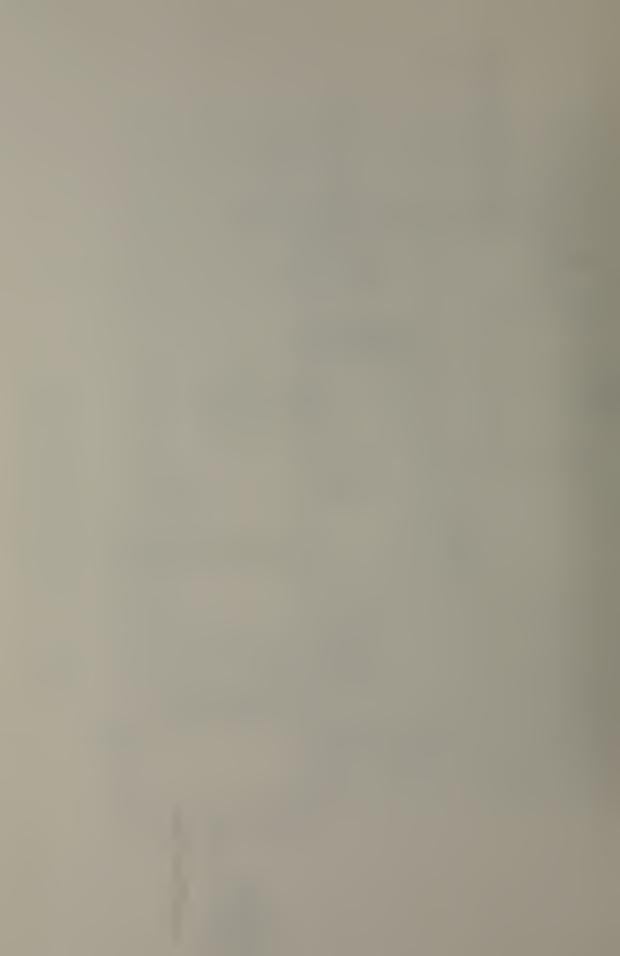


FIGURE 5. Gas Generator Fuel System



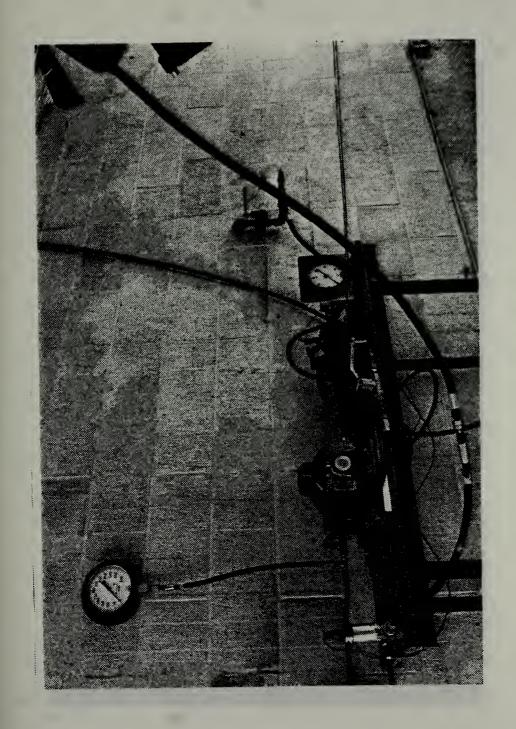


FIGURE 6. Gas Generator Fuel Supply System

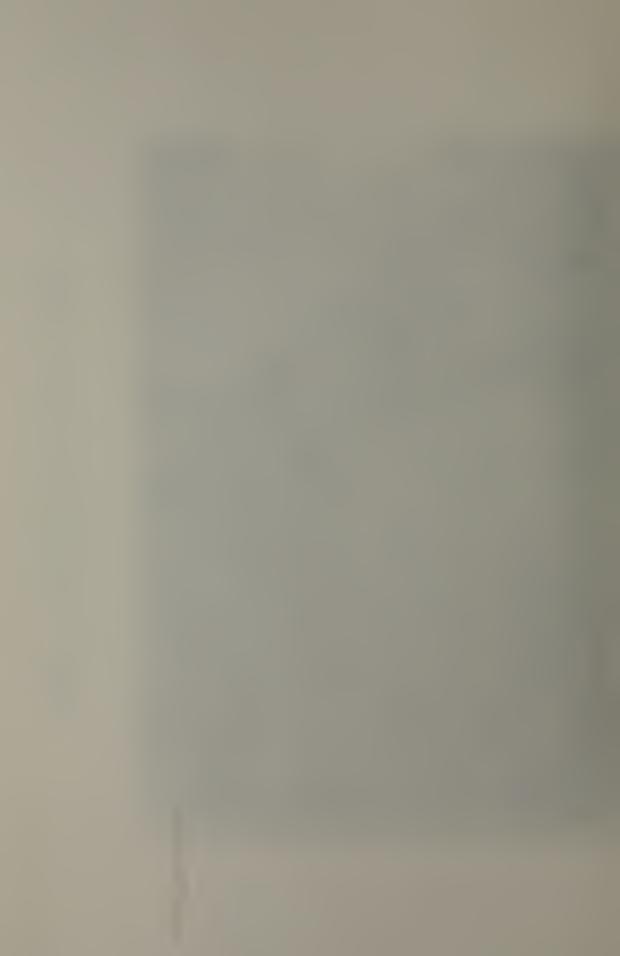
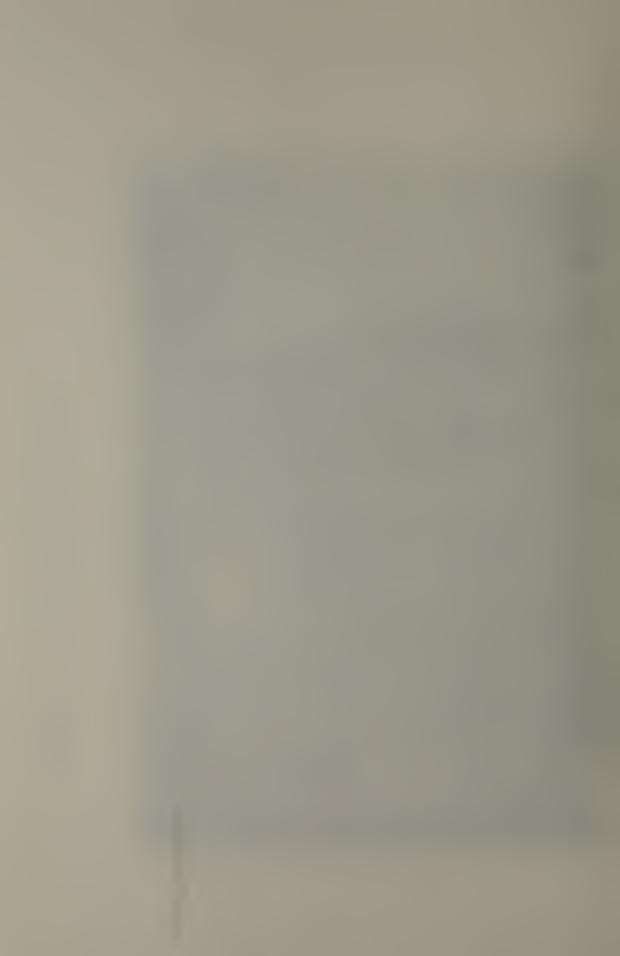


FIGURE 7. Eductor Air Metering Box



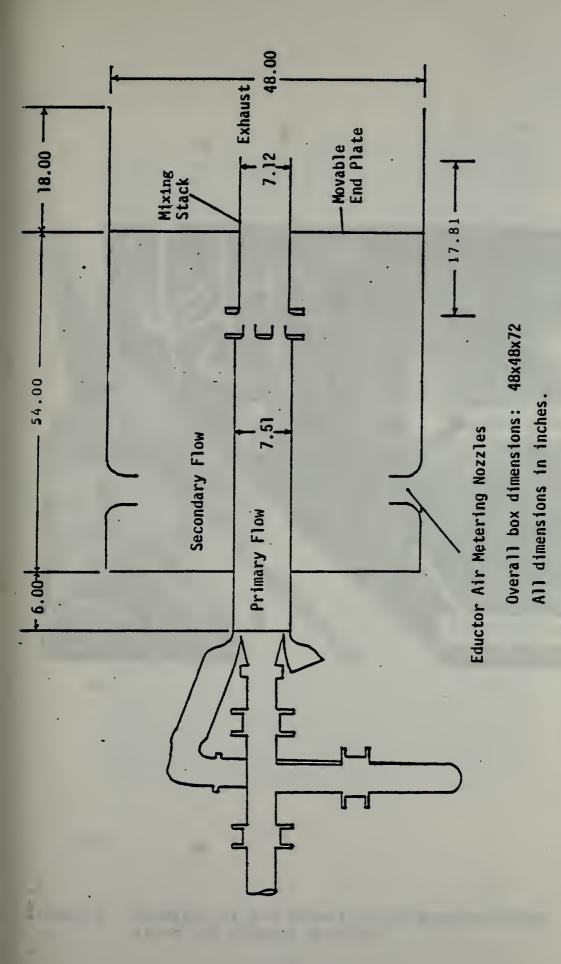


FIGURE 8. Eductor Air Metering Box Arrangement

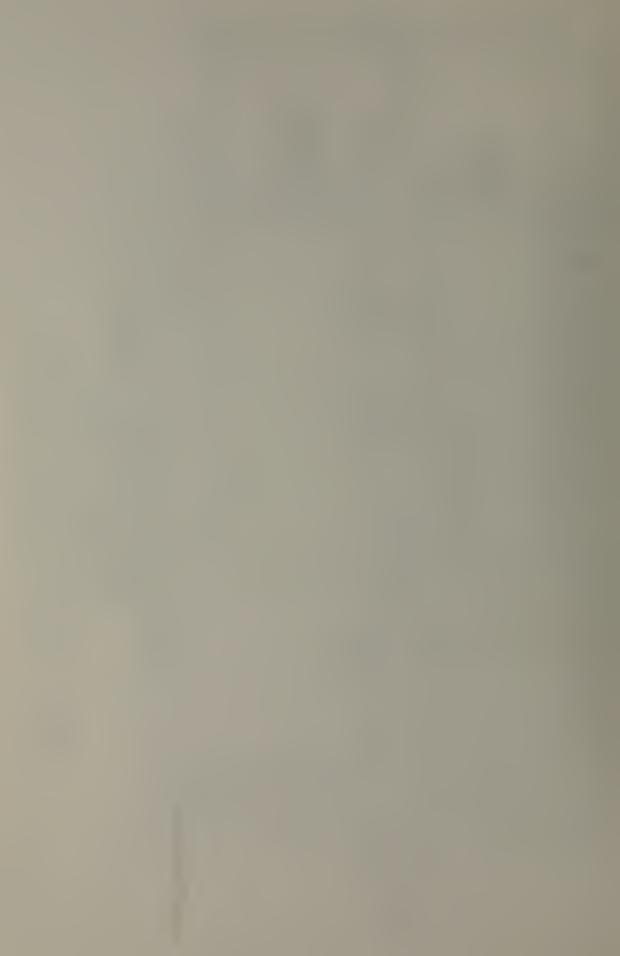




FIGURE 9. Interior of Air Metering Box Showing Uptake Stack and Primary Nozzles



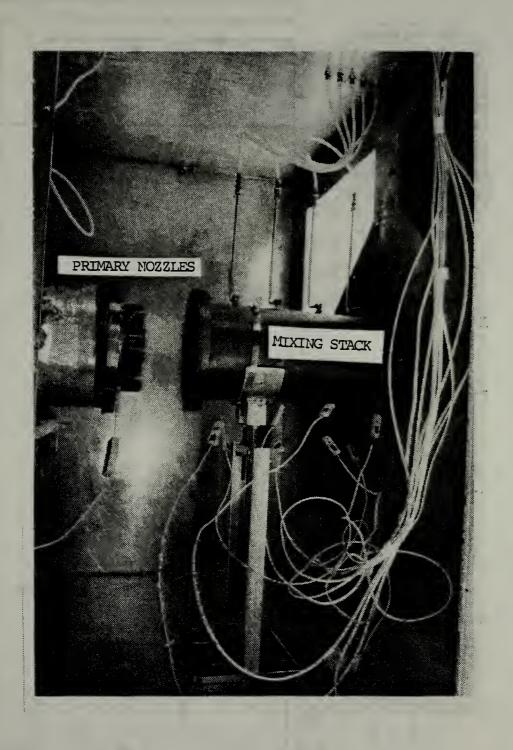
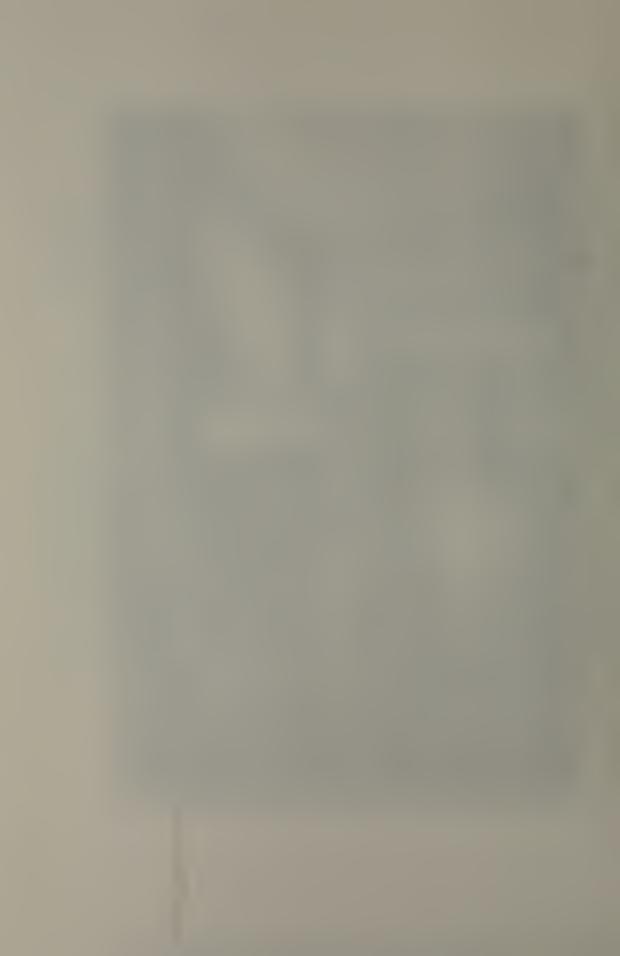
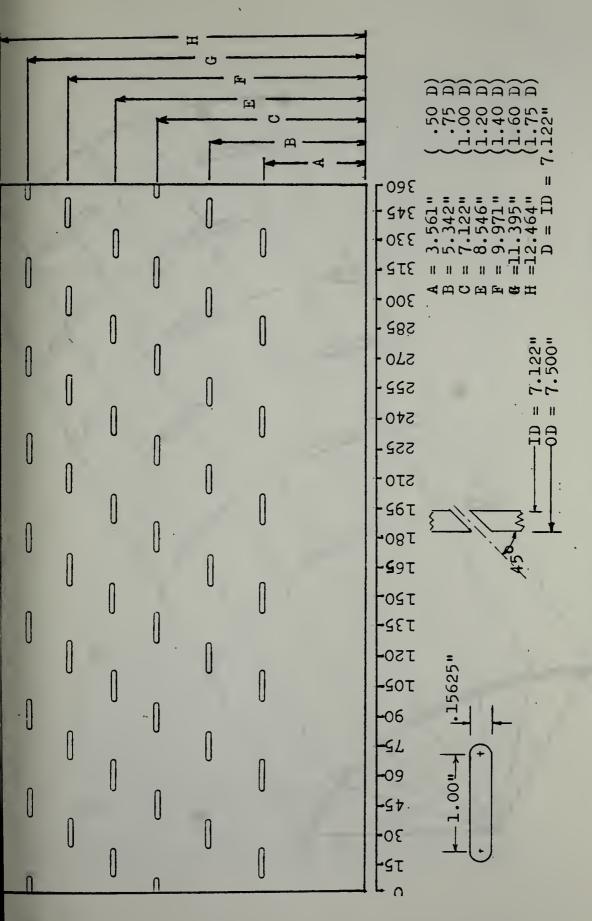


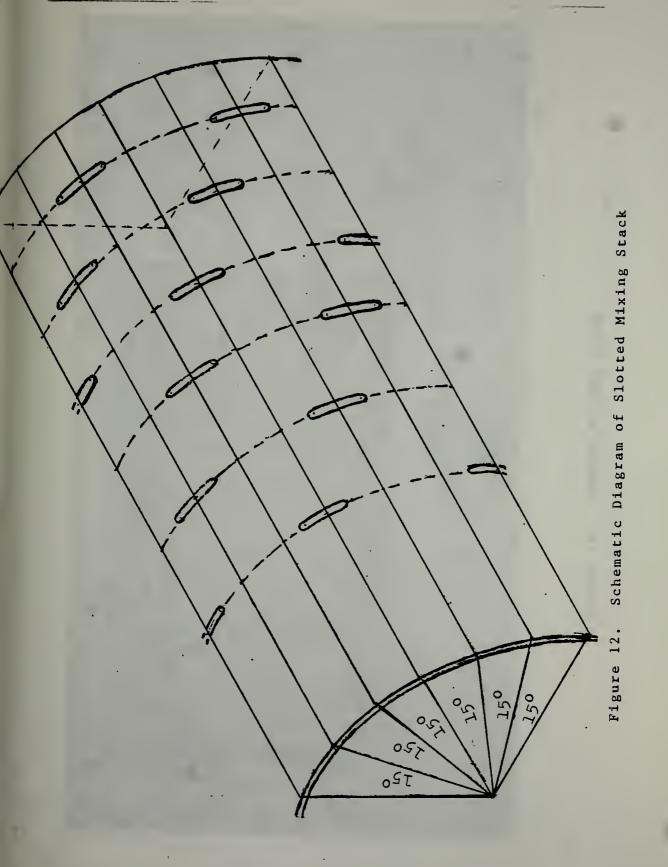
FIGURE 10. Interior of Air Metering Box Showing Mixing Stack and Primary Nozzles





Dimensional Diagram of Expanded Slotted Mixing Stack Figure 11.





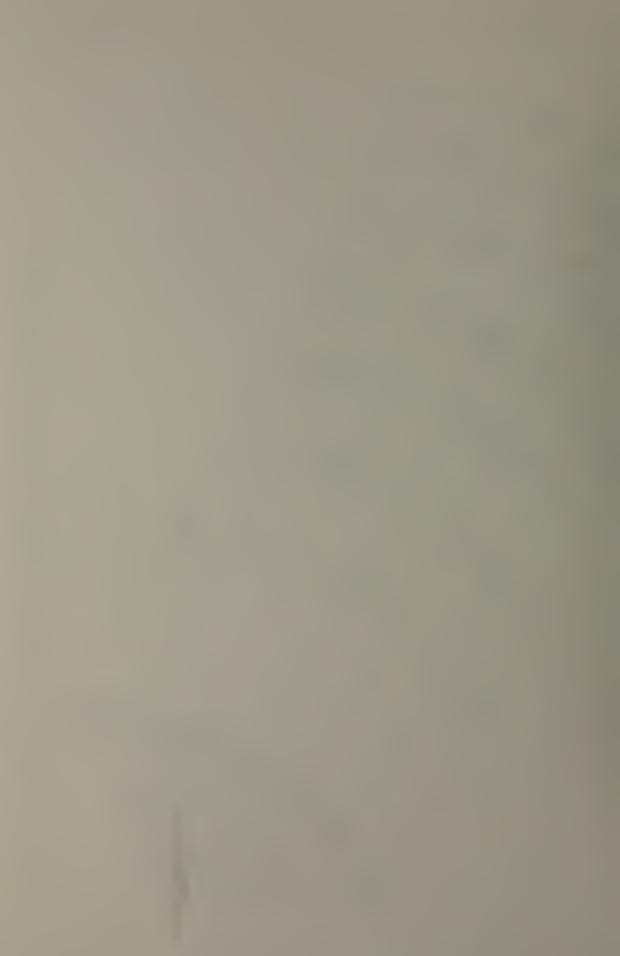
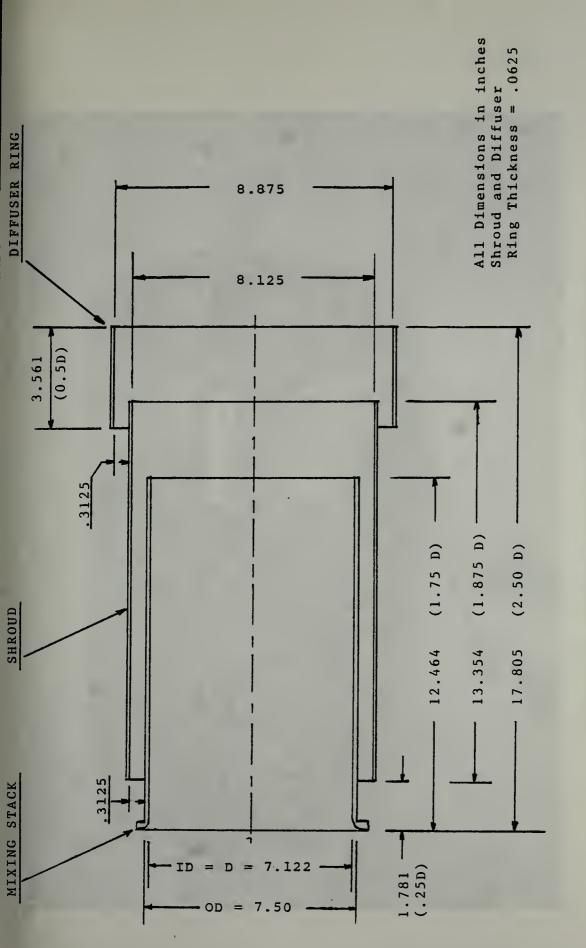


Figure 13. SLOTTED MIXING STACK





Dimensional Diagram of Mixing Stack with One Diffuser Ring Figure 14.



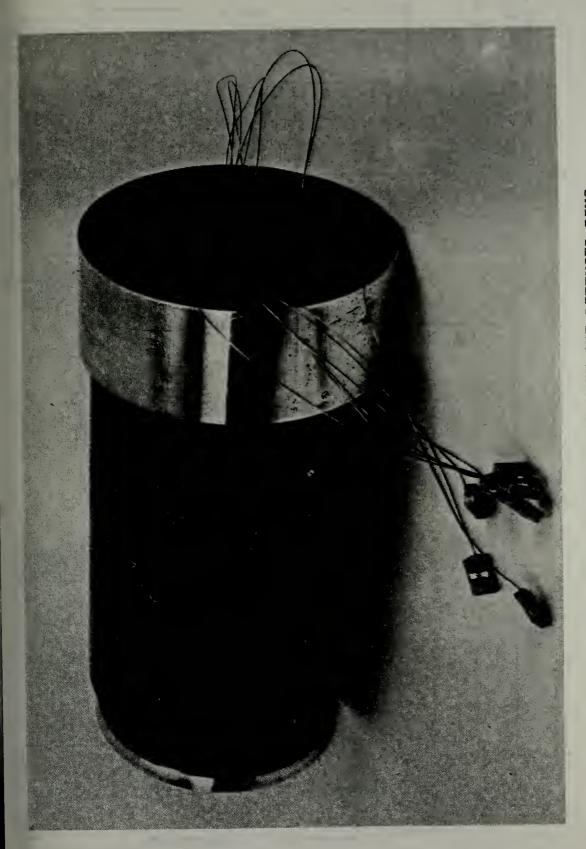
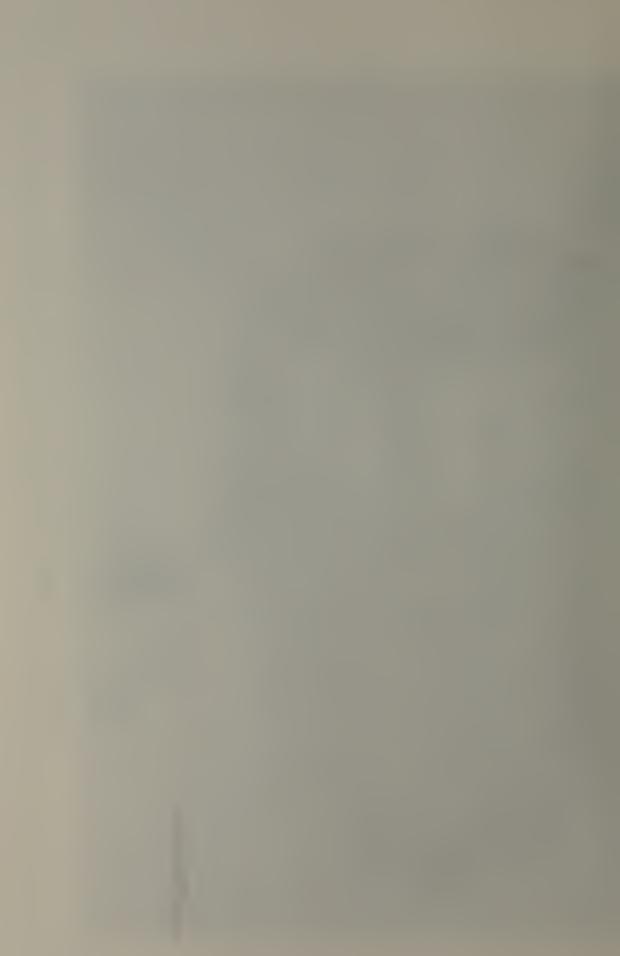
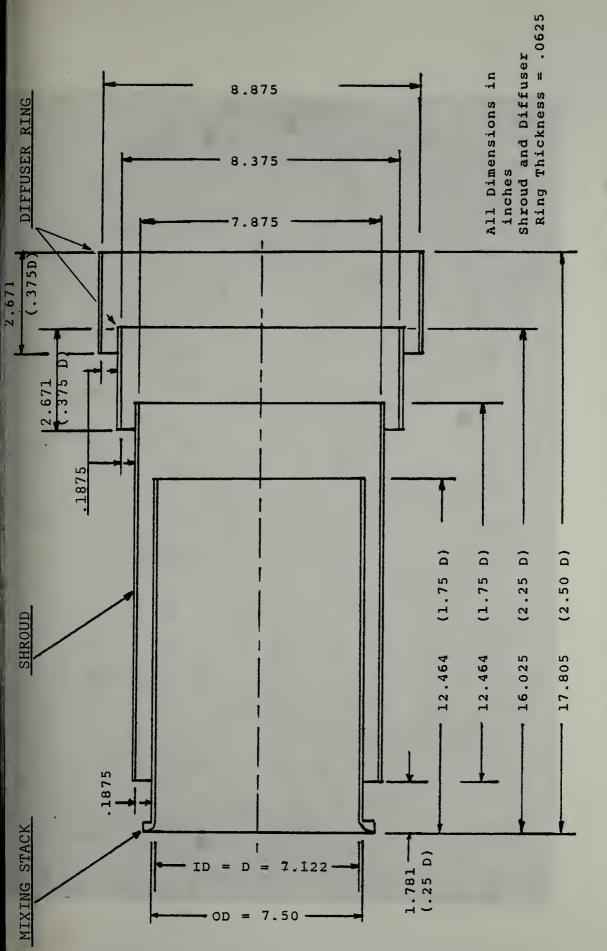


Figure 15. MIXING STACK WITH ONE DIFFUSER RING





Dimensional Diagram of Mixing Stack with Two Diffuser Rings Figure 16.







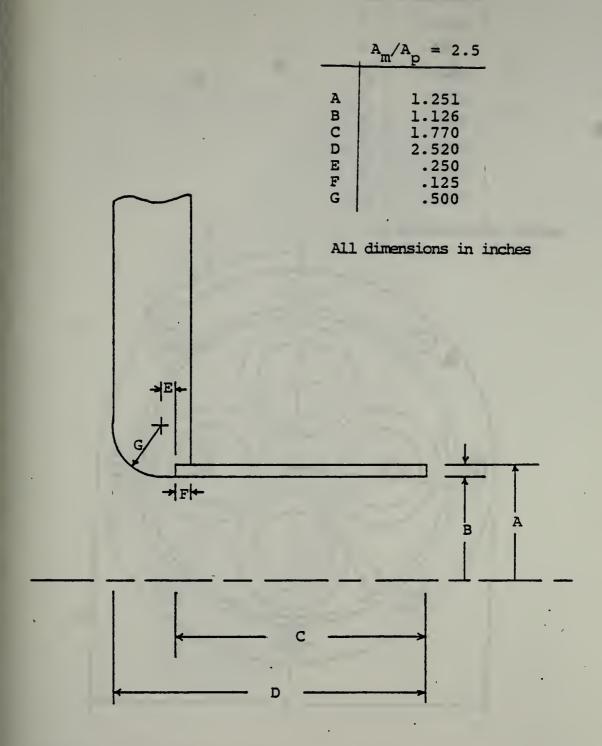


FIGURE 18. Dimensional Diagram of Primary Flow Nozzles



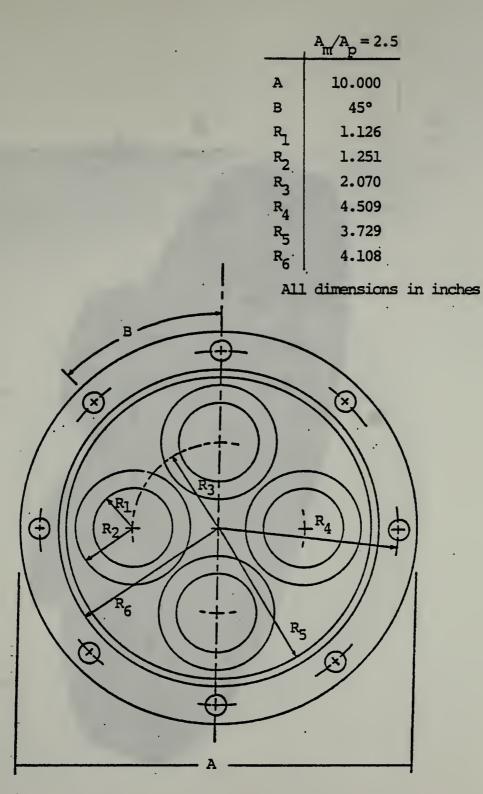
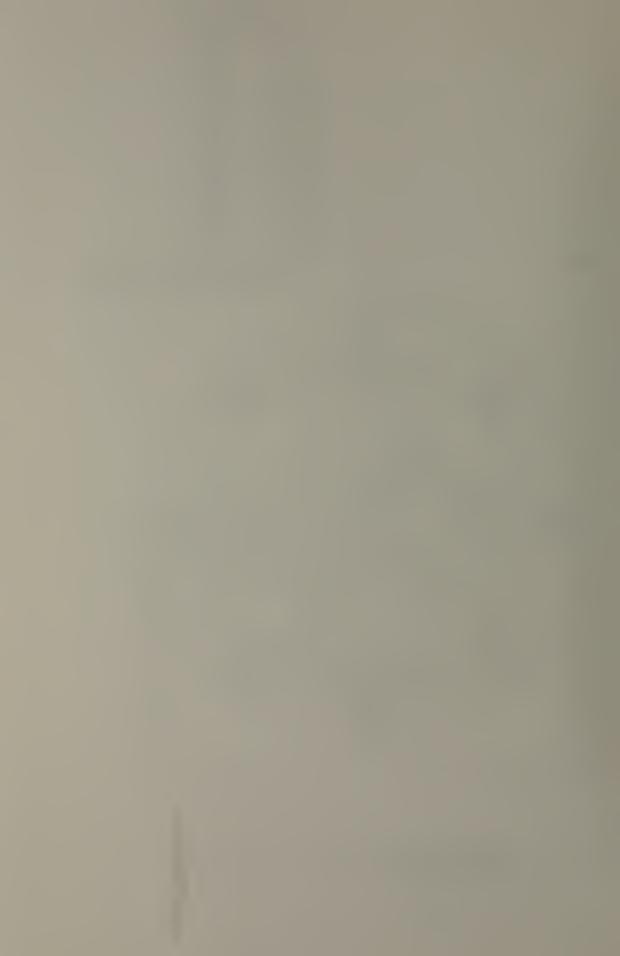


FIGURE 19. Dimension Diagram of Primary Flow Nozzle Plate



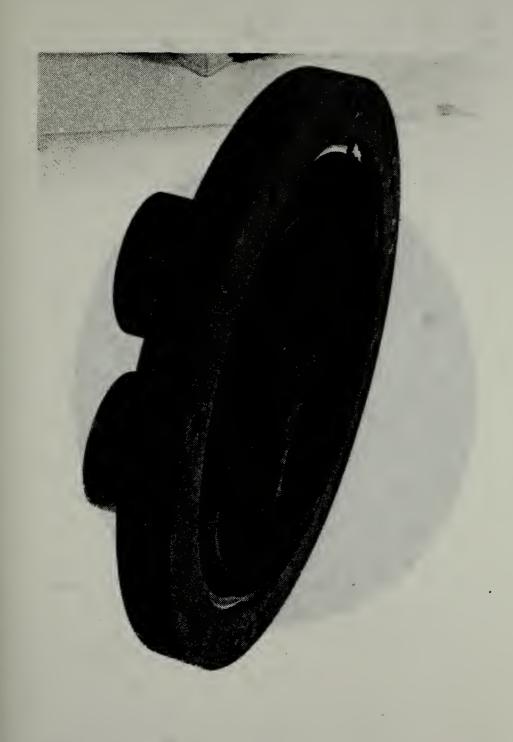


FIGURE 20. Primary Flow Nozzle Plate (Back View)



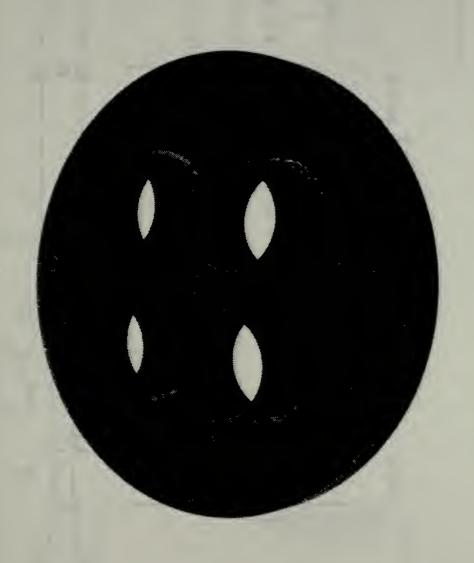
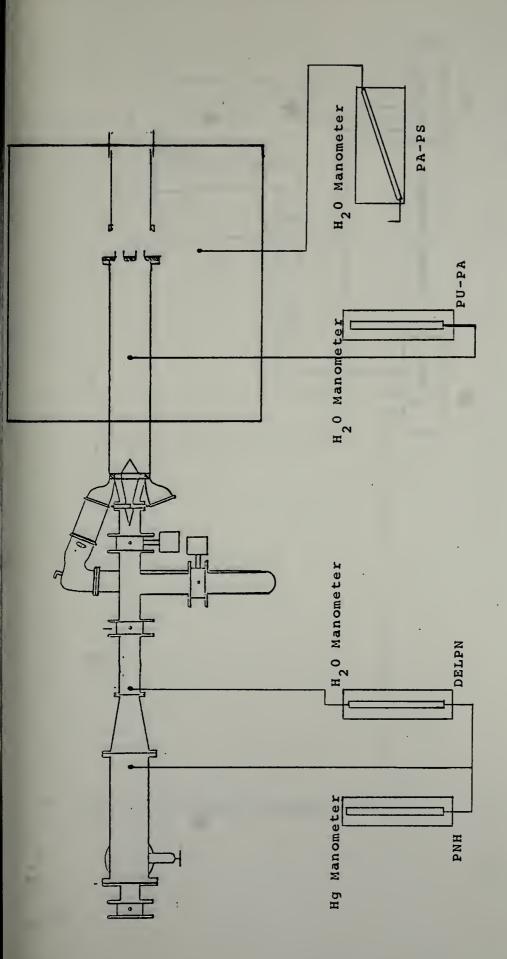
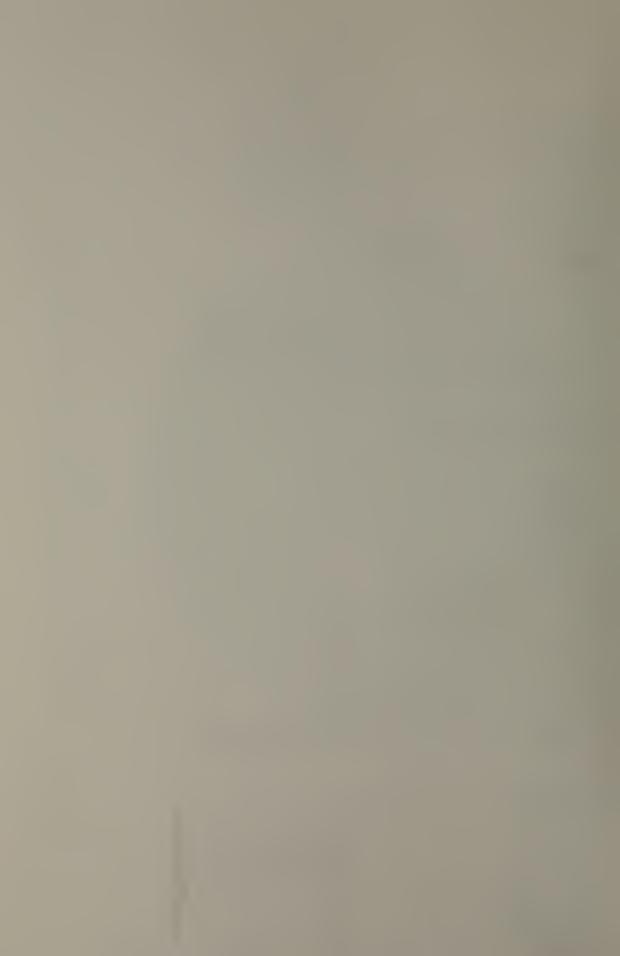


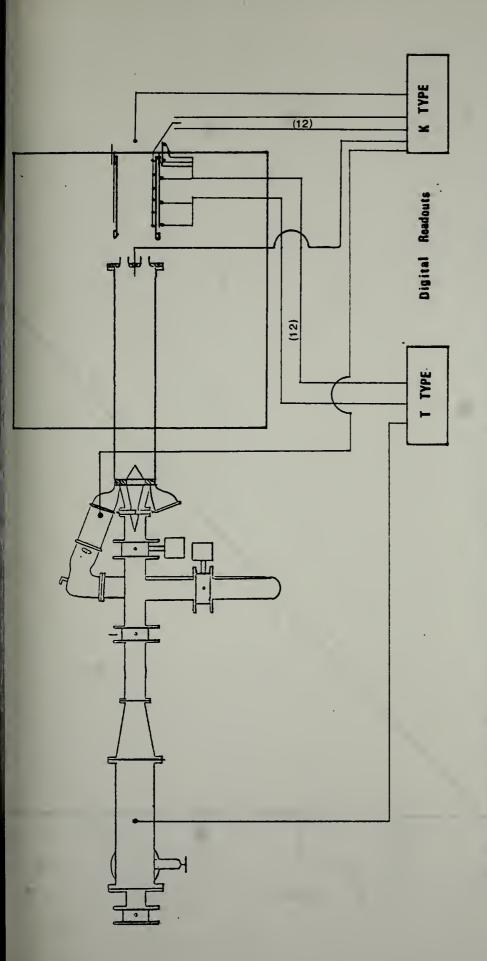
FIGURE 21. Primary Flow Nozzle Plate (Front View)



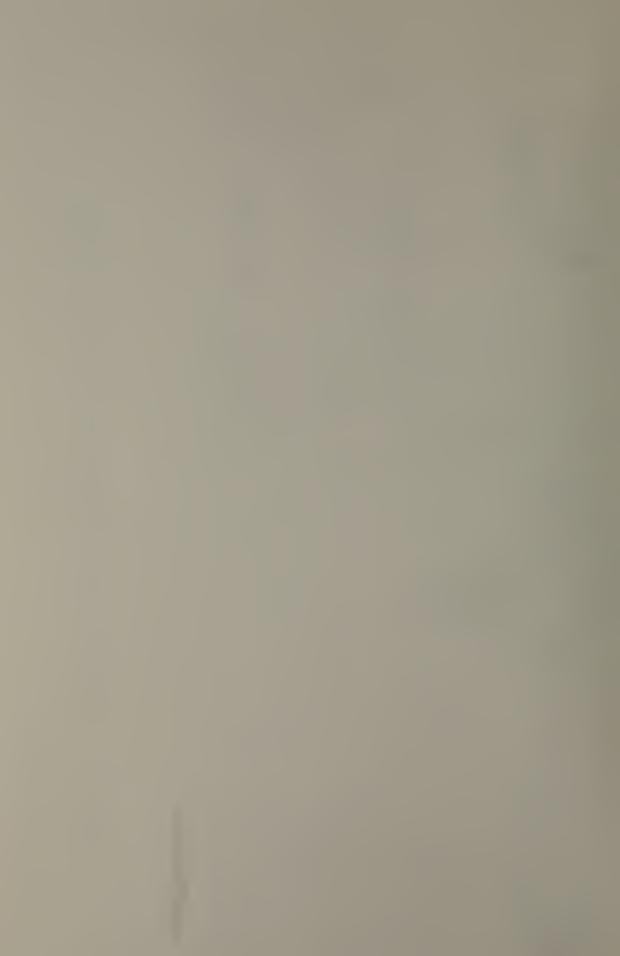


Schematic Diagram of Pressure Measurement System Figure 22.





Schematic Diagram of Temperature Measurement System Figure 23.



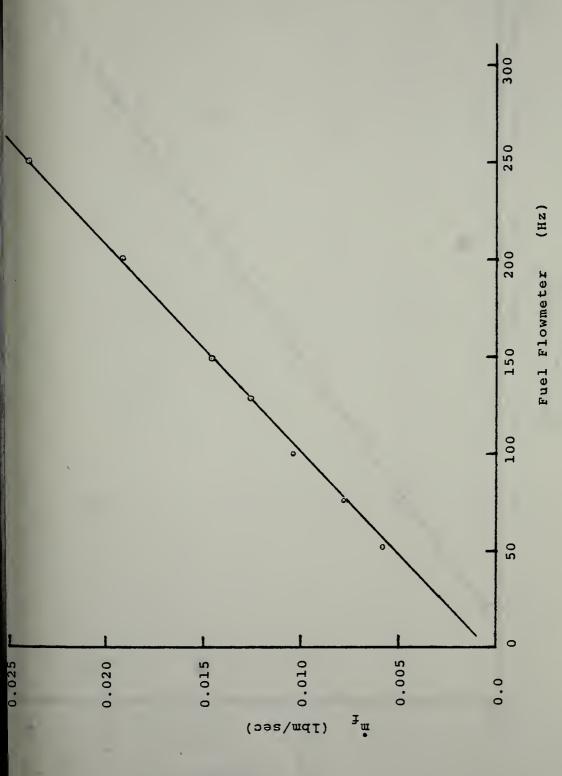


Figure 24. Fuel Flow Calibration Curve



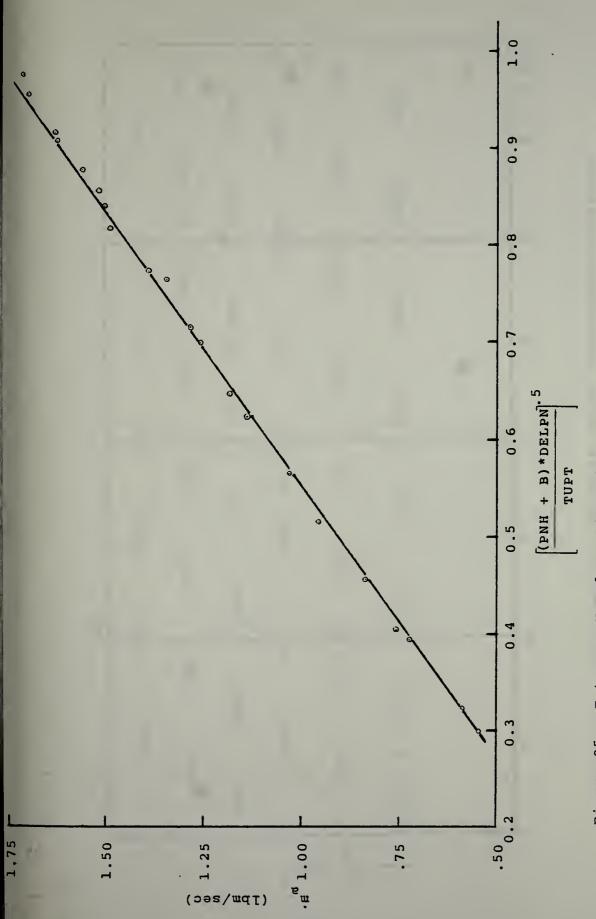
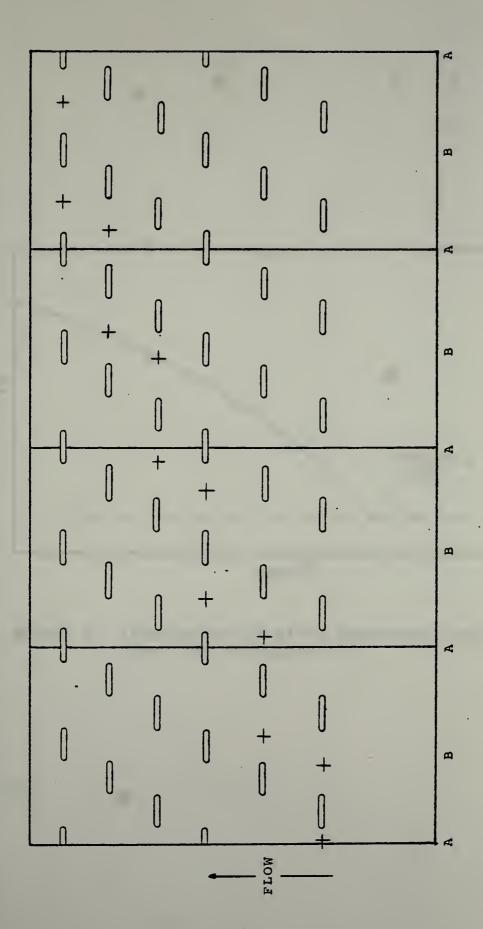
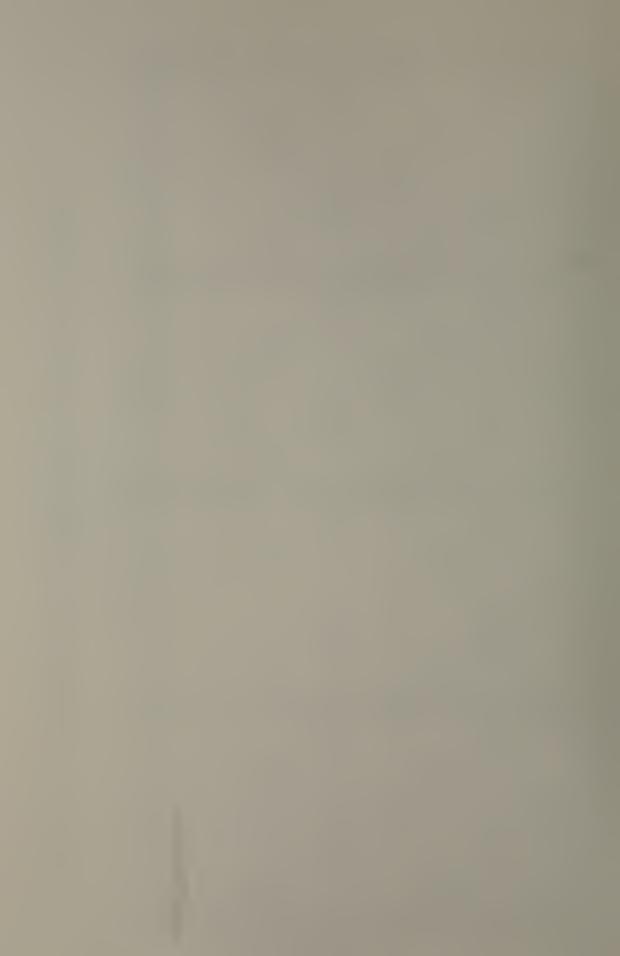


Figure 25. Entrance Nozzle Calibration Curve





Developed View of Mixing Stack Thermocouple Locations Figure 26.



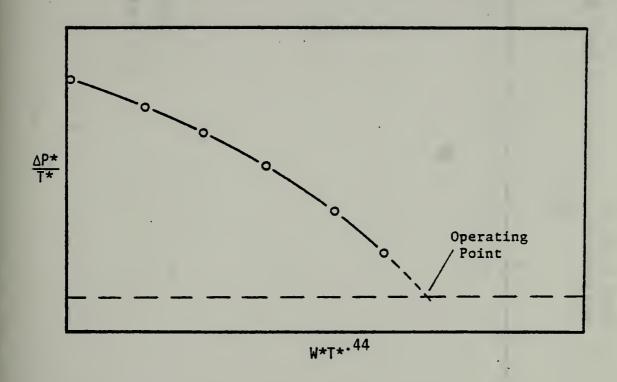
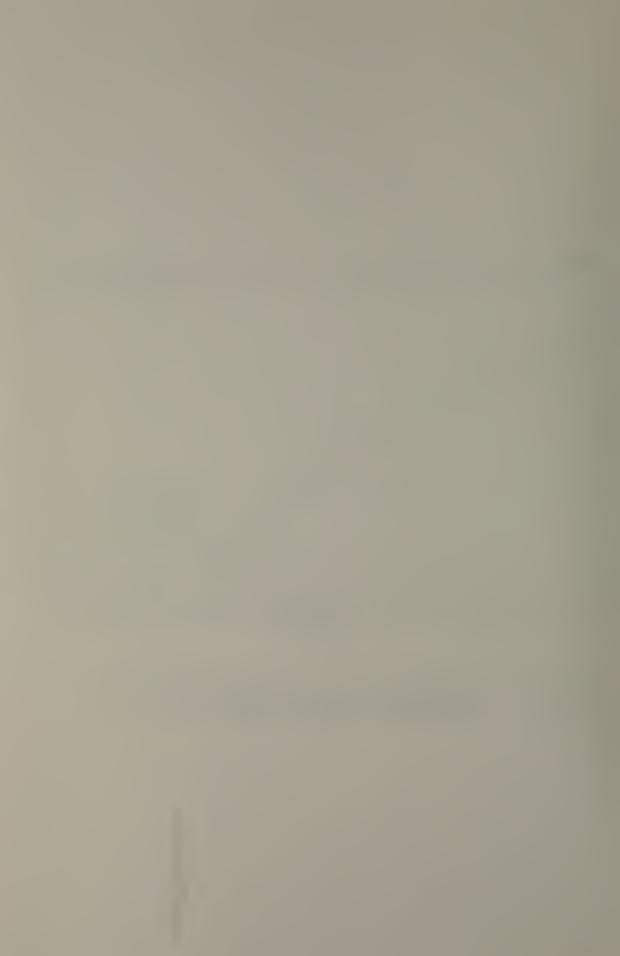
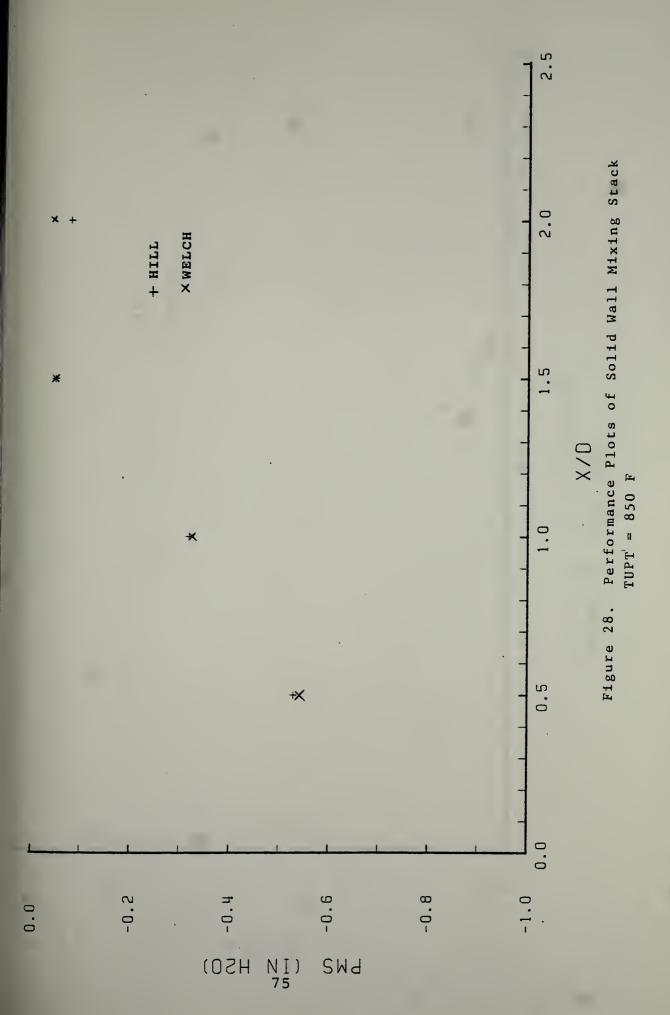
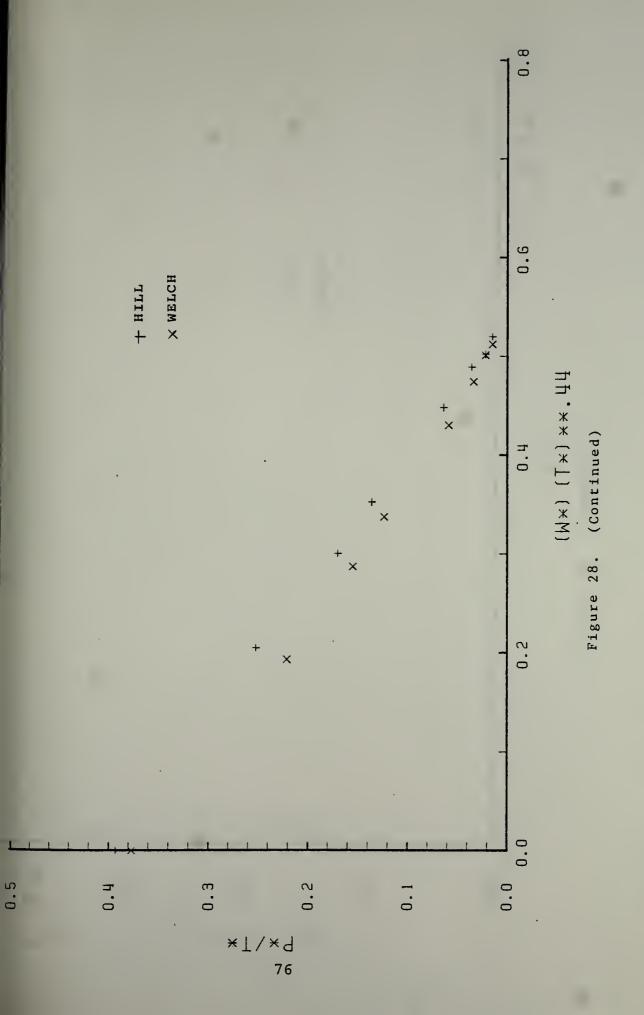


FIGURE 27. Illustrative Plot of the Experimental Data Correlation in Equation (14).

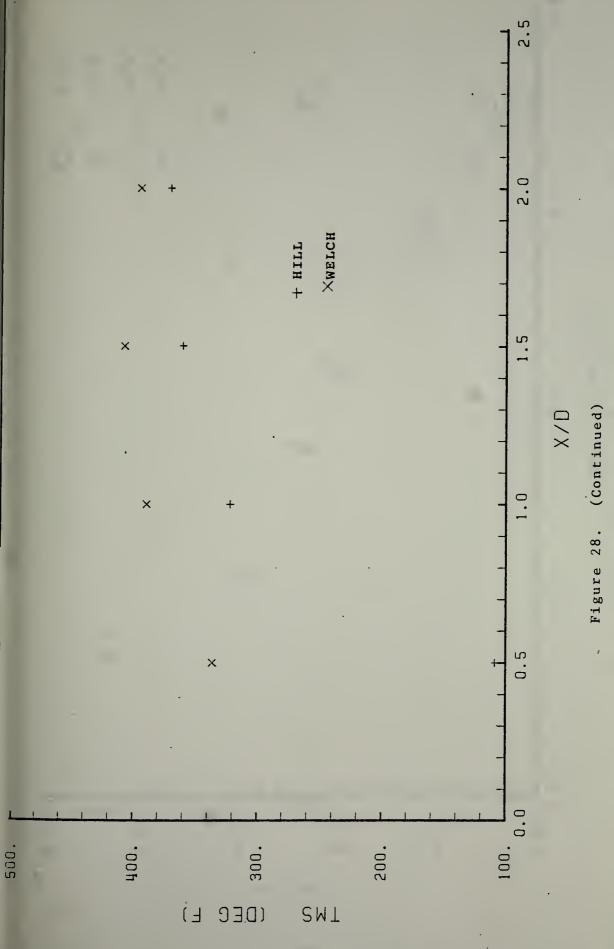




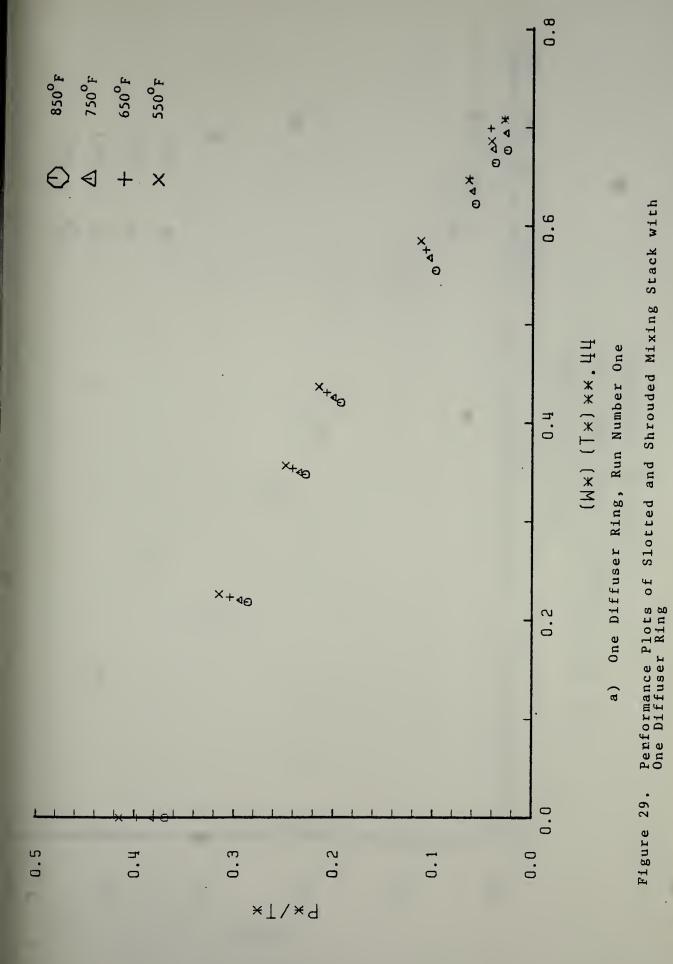




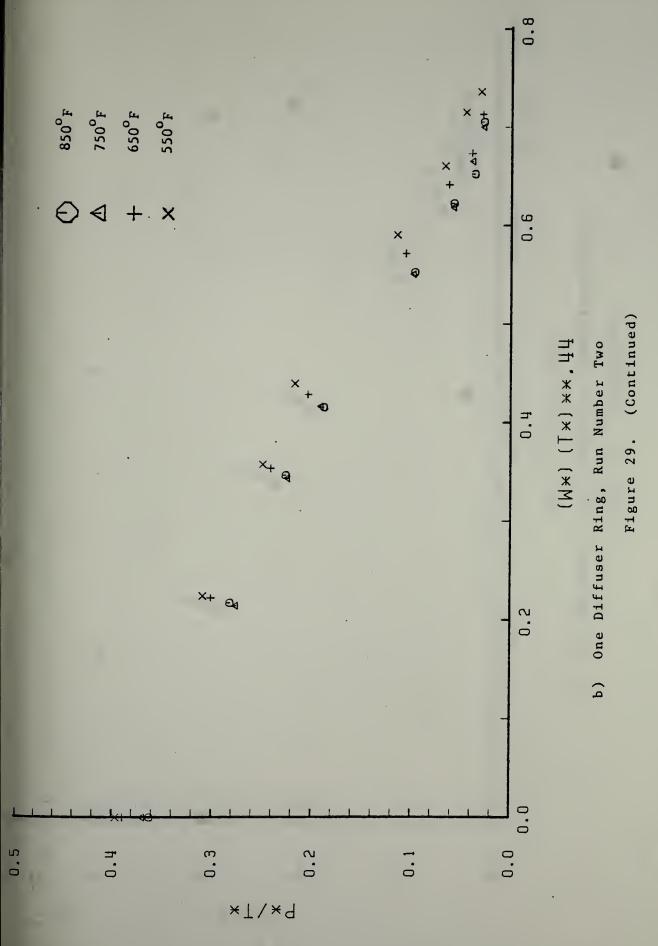




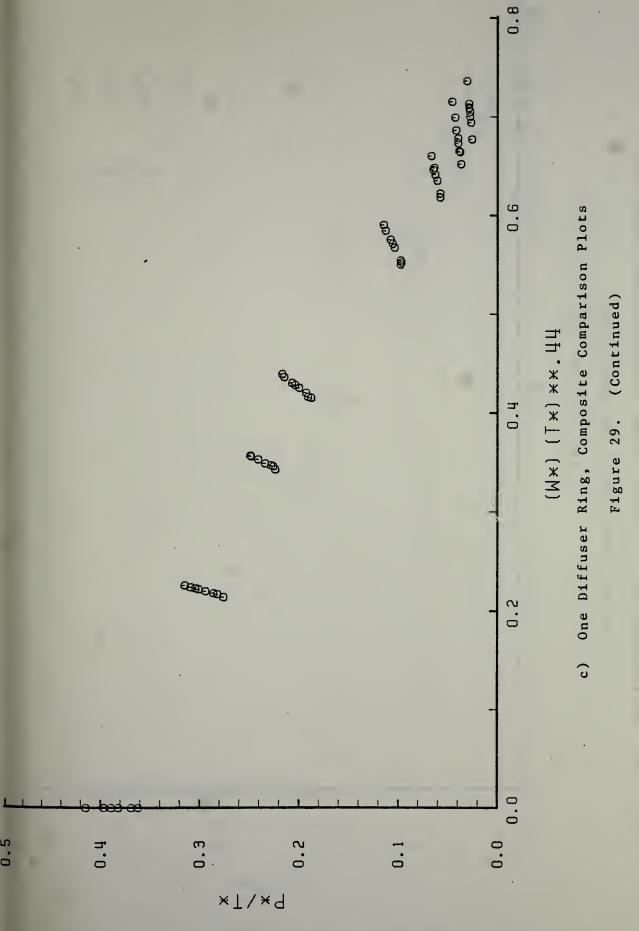




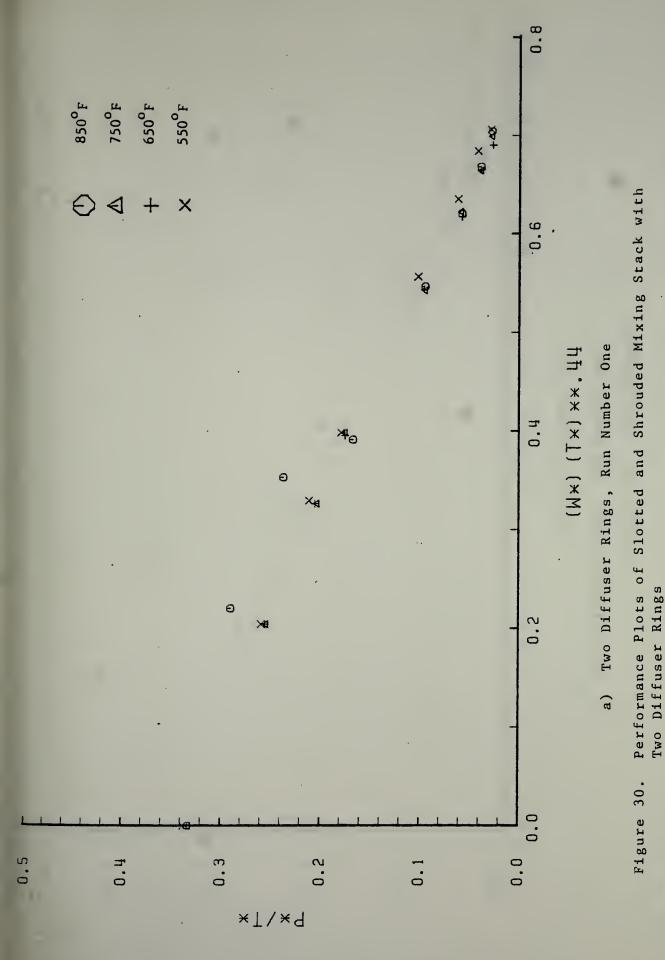




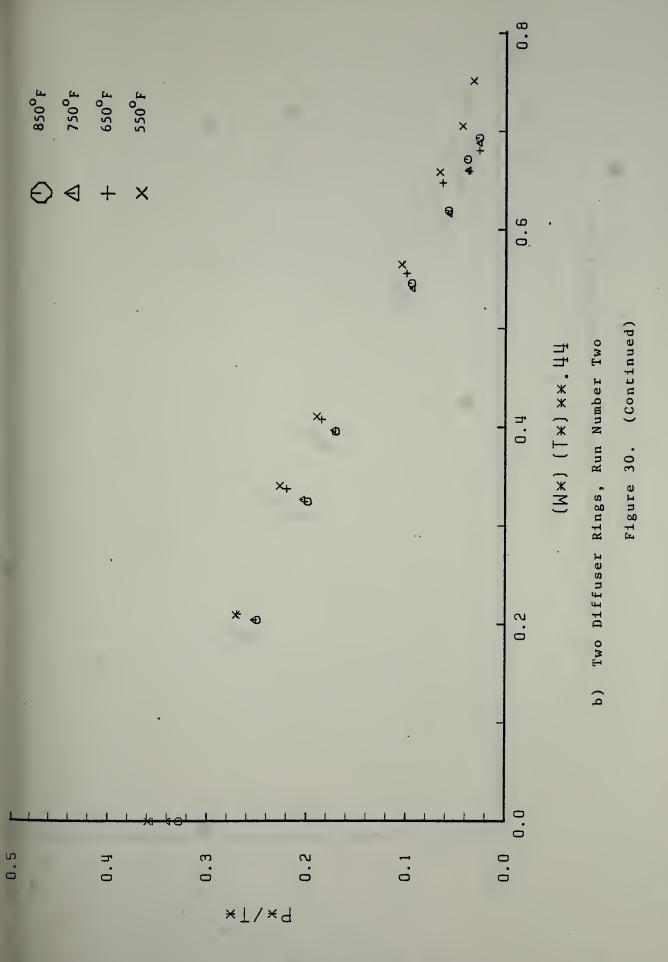




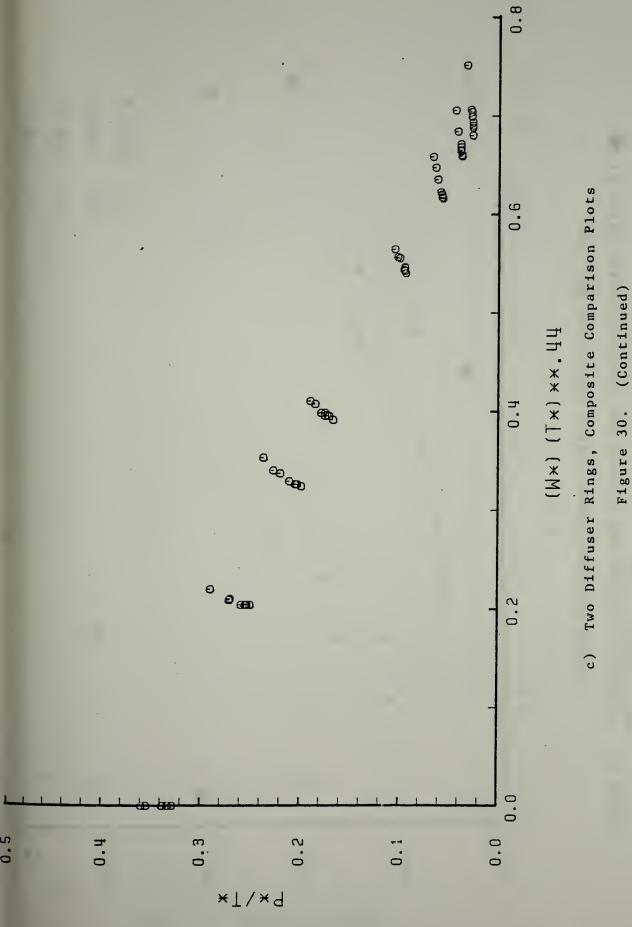




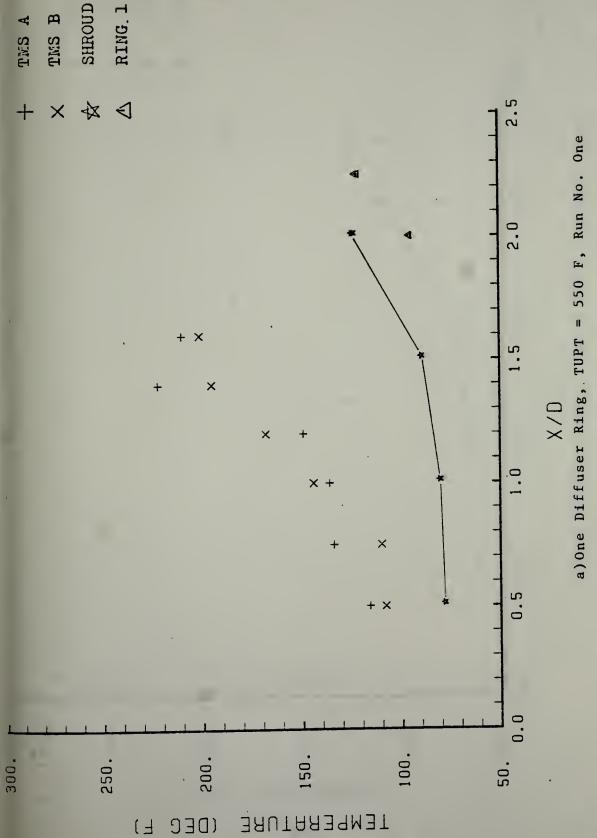






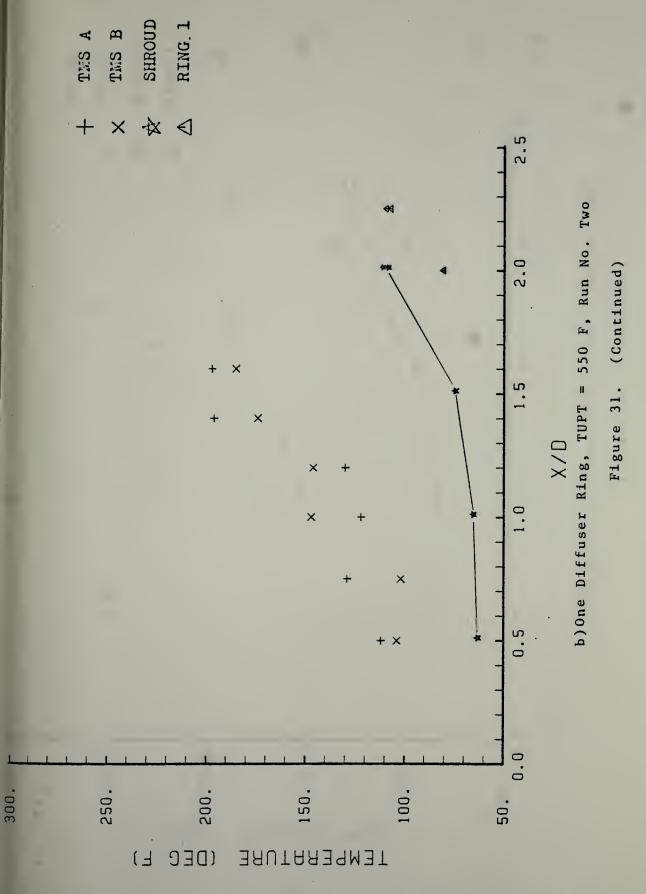




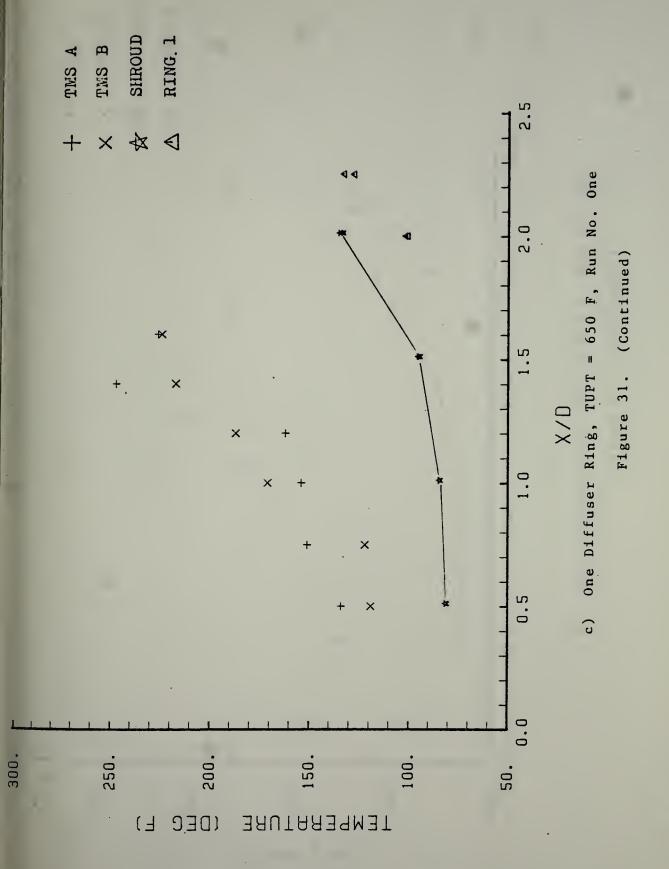


Temperature Plots for Slotted and Shrouded Mixing Stack with One Diffuser Ring Figure 31.

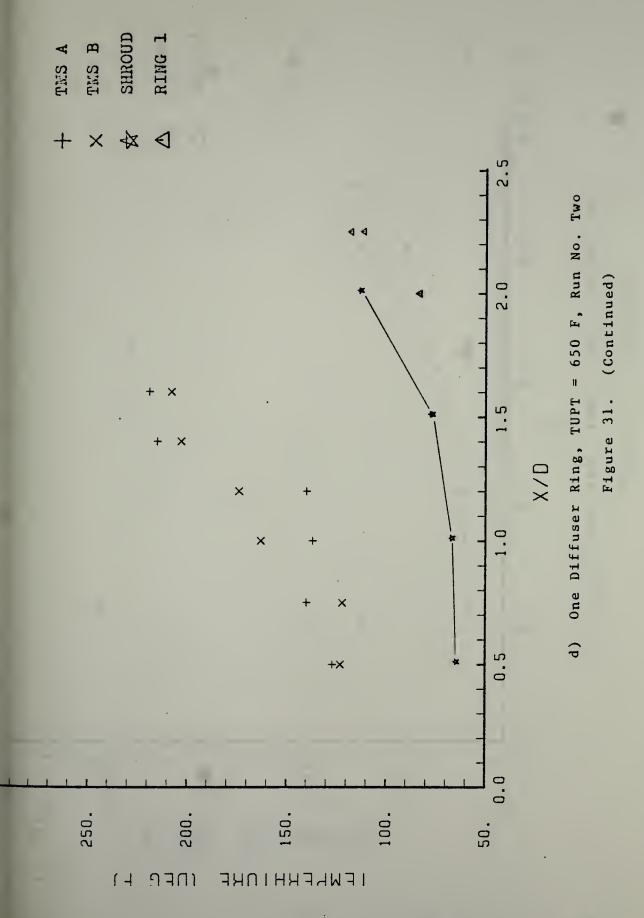




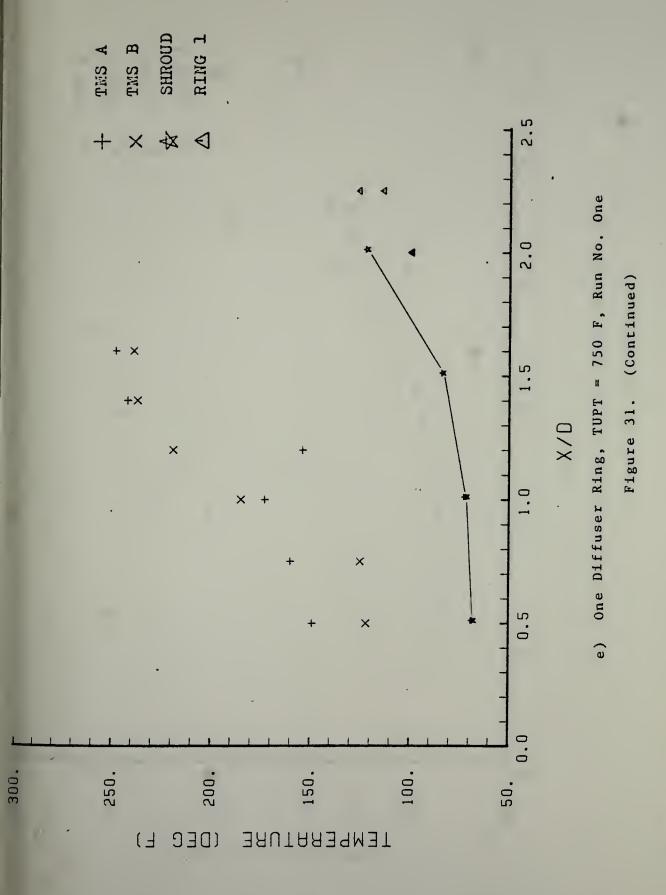


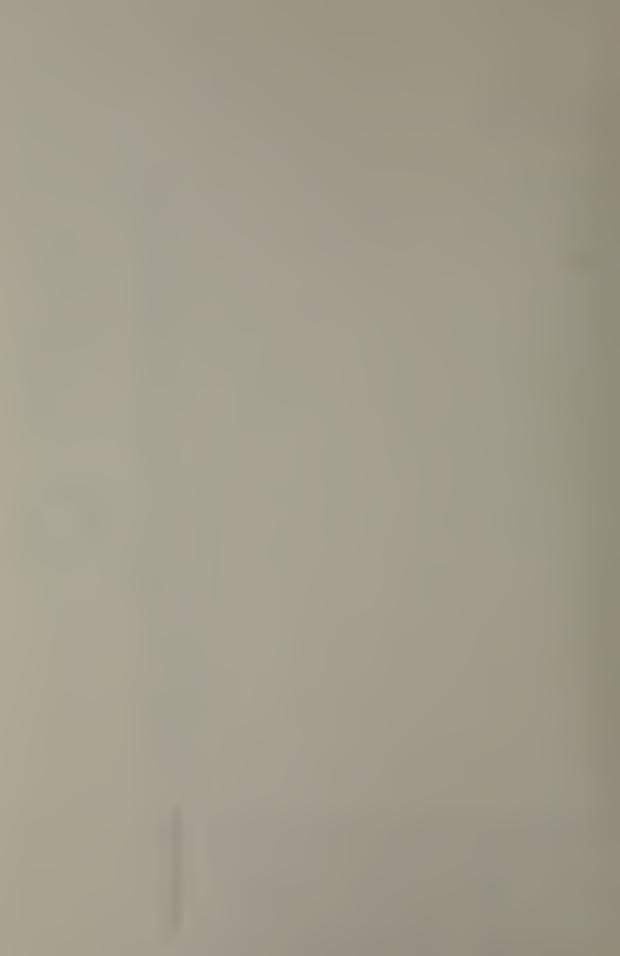


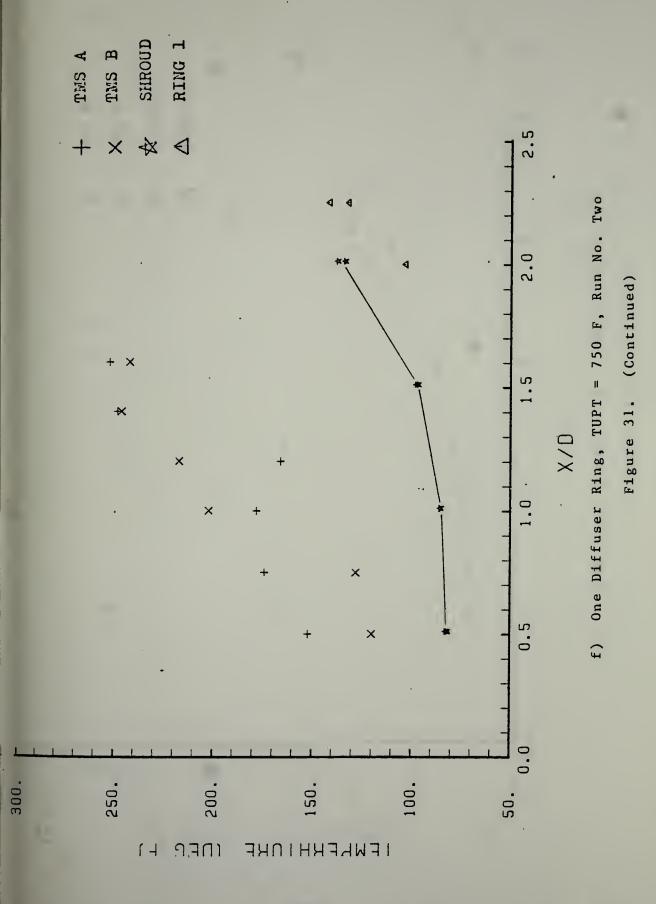




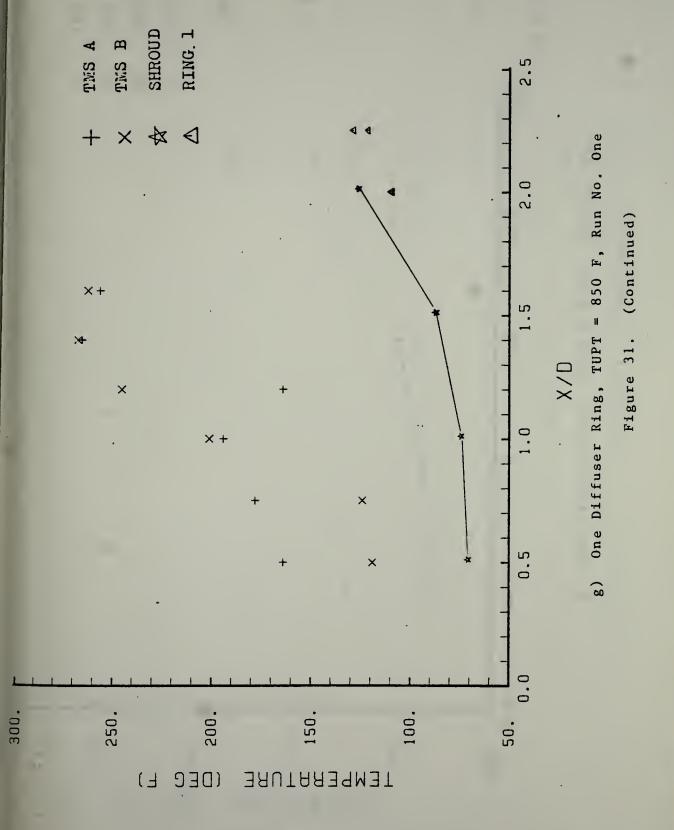




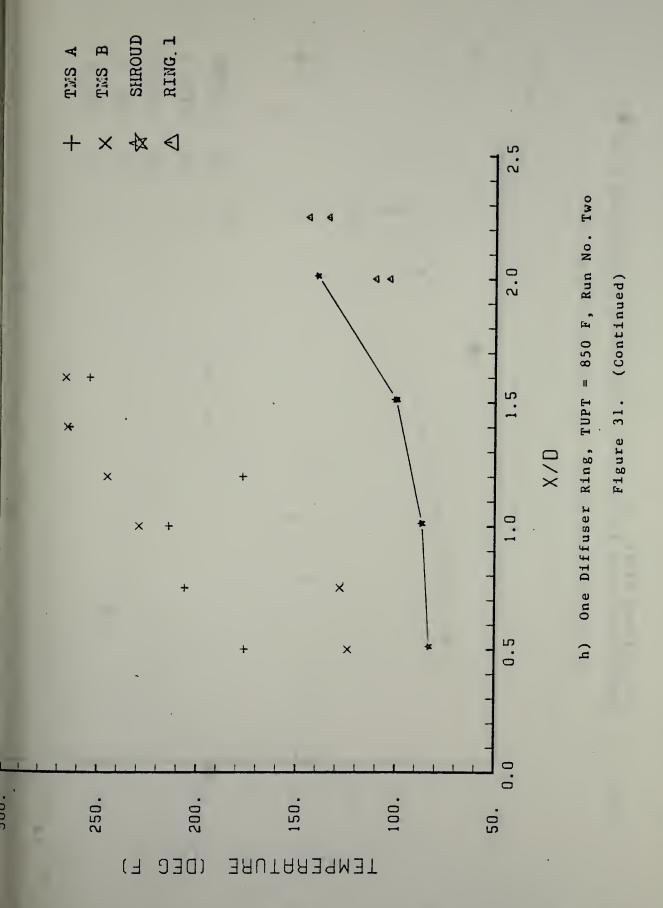




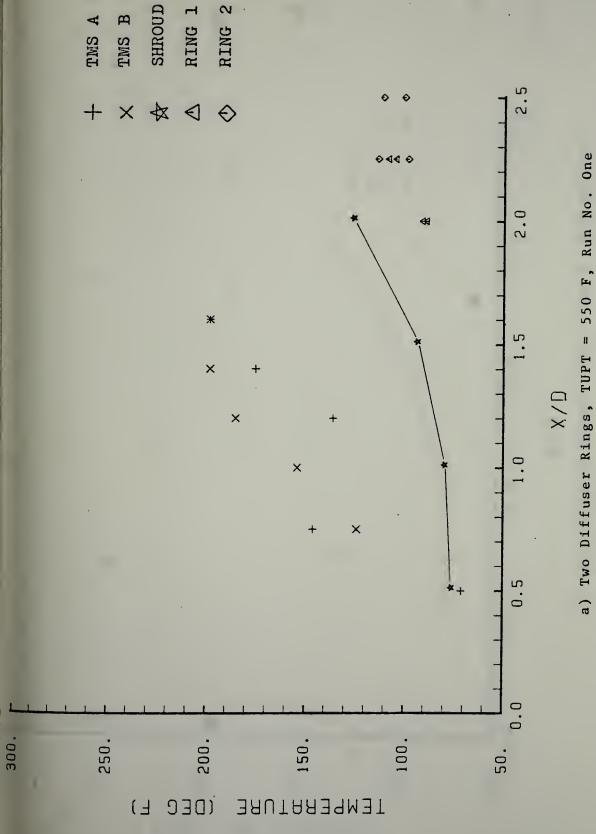






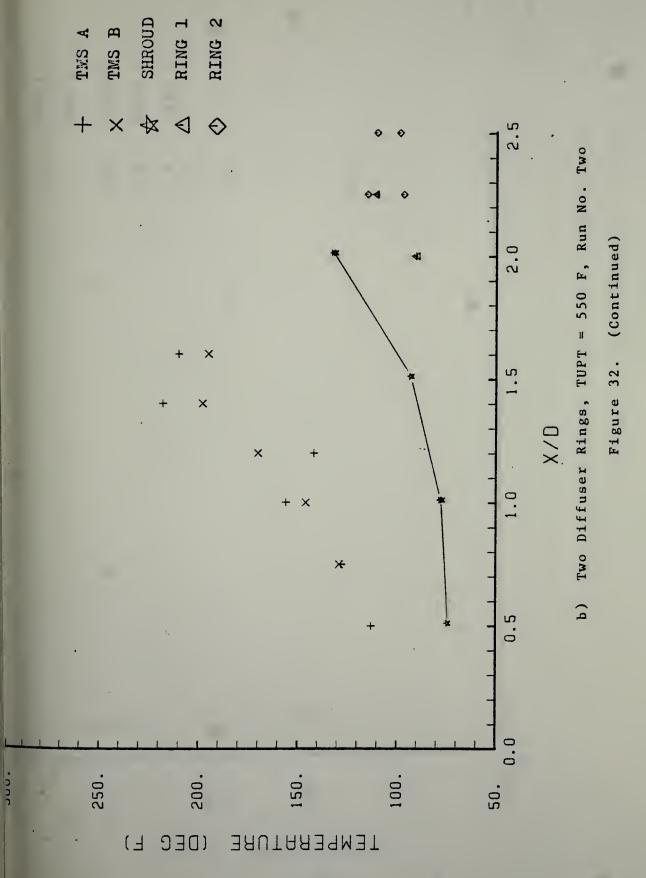




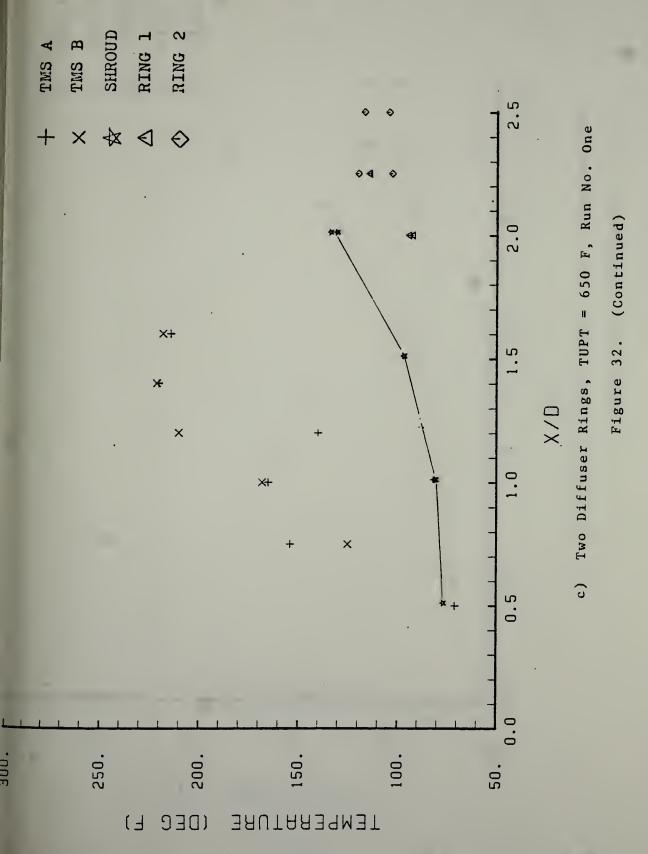


Temperature Plots for Slotted and Shrouded Mixing Stack with Two Diffuser Rings Figure 32.

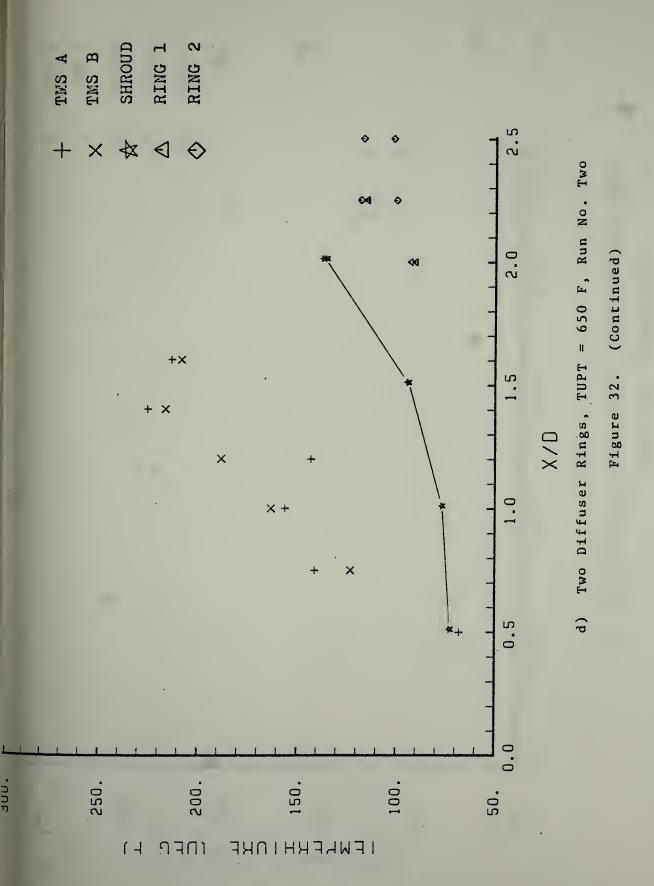




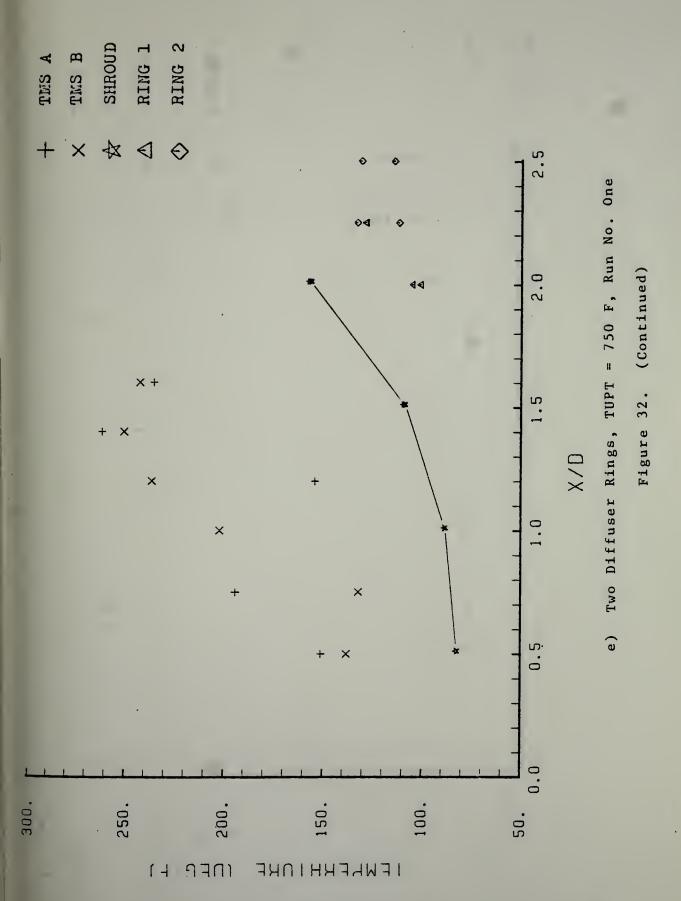




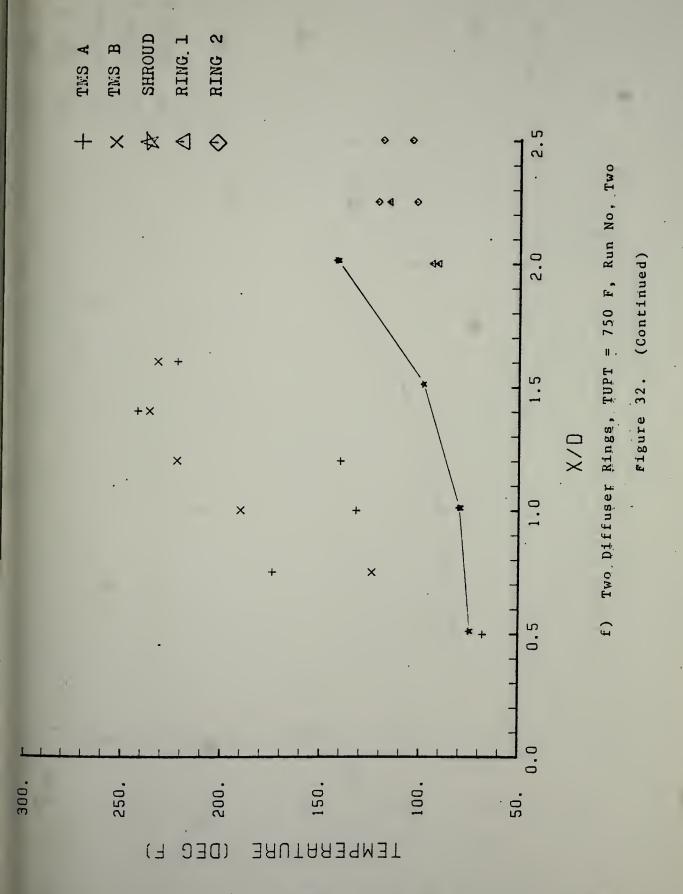




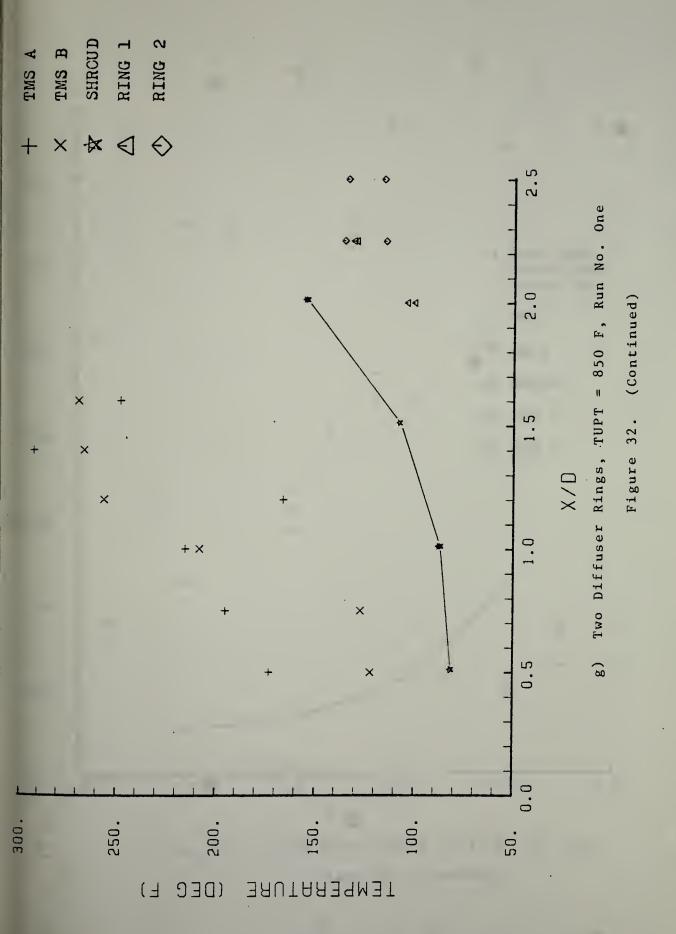




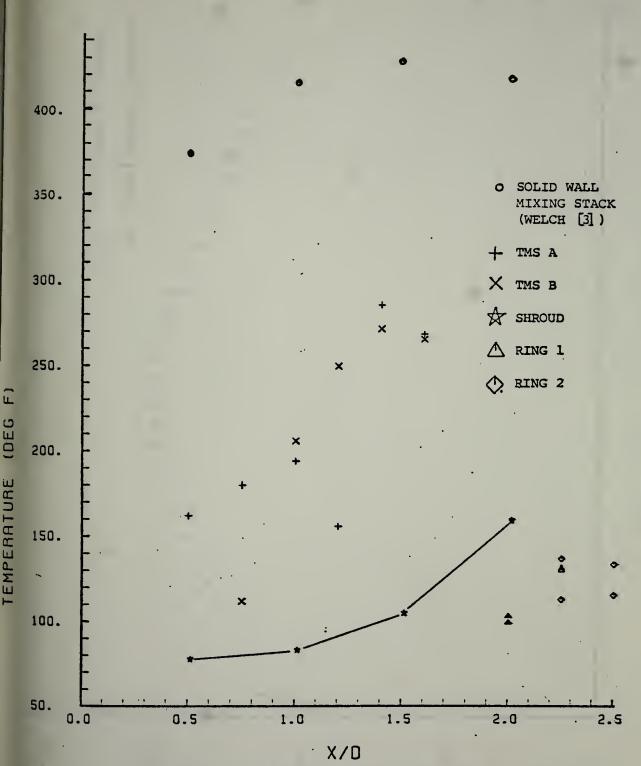






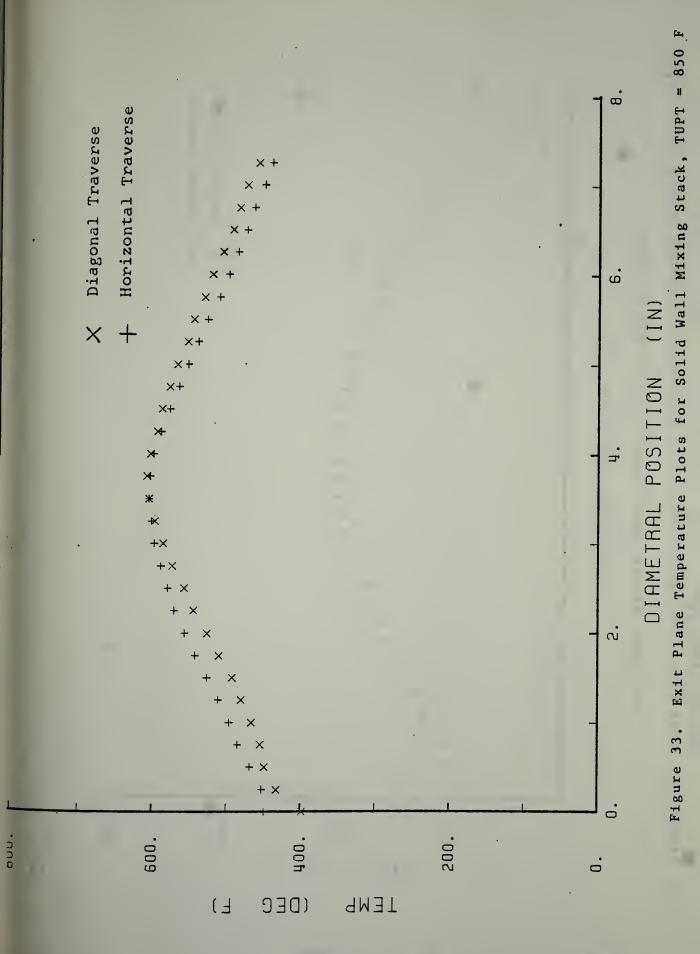




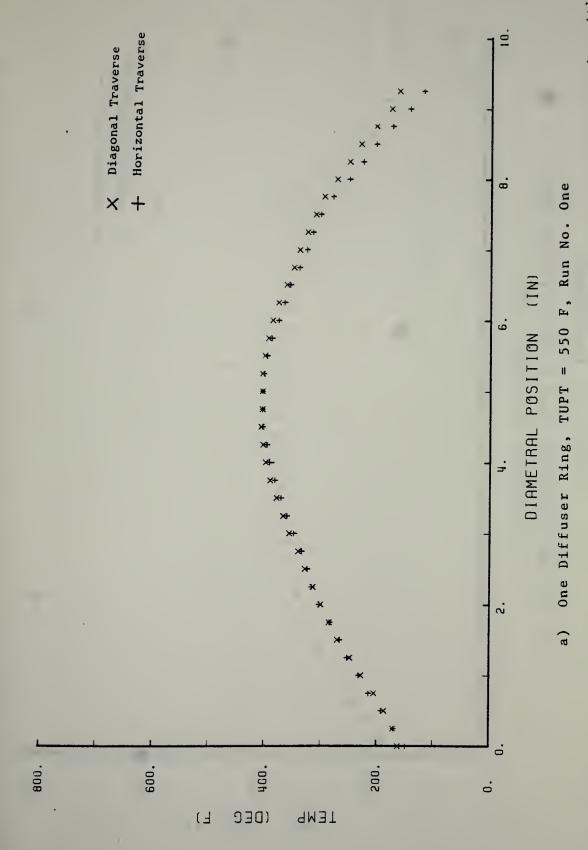


h) Two Diffuser Rings, TUPT = 850 F, Run No. Two-Figure 32. (Continued)



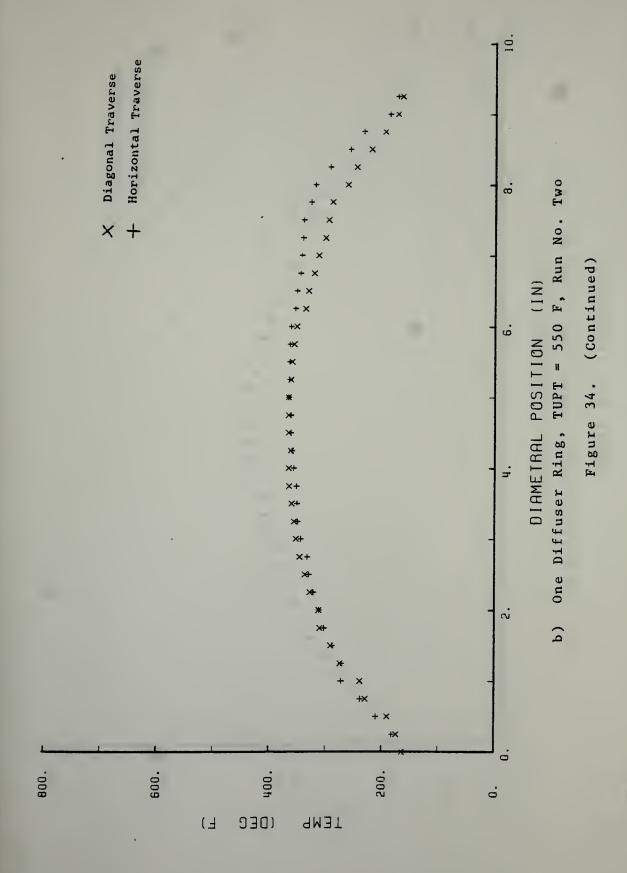




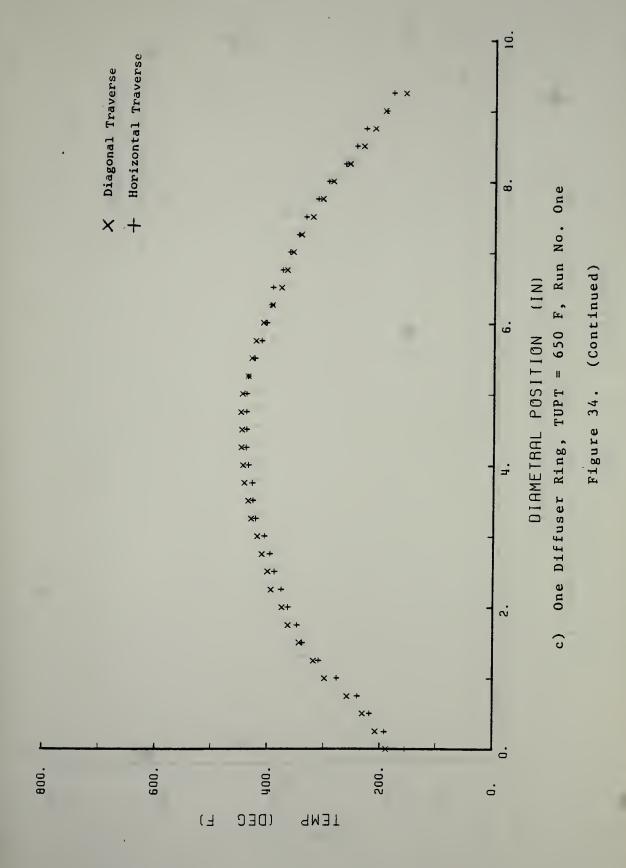


Exit Plane Temperature Plots for Slotted and Shrouded Mixing Stack, with One Diffuser Ring Figure 34.

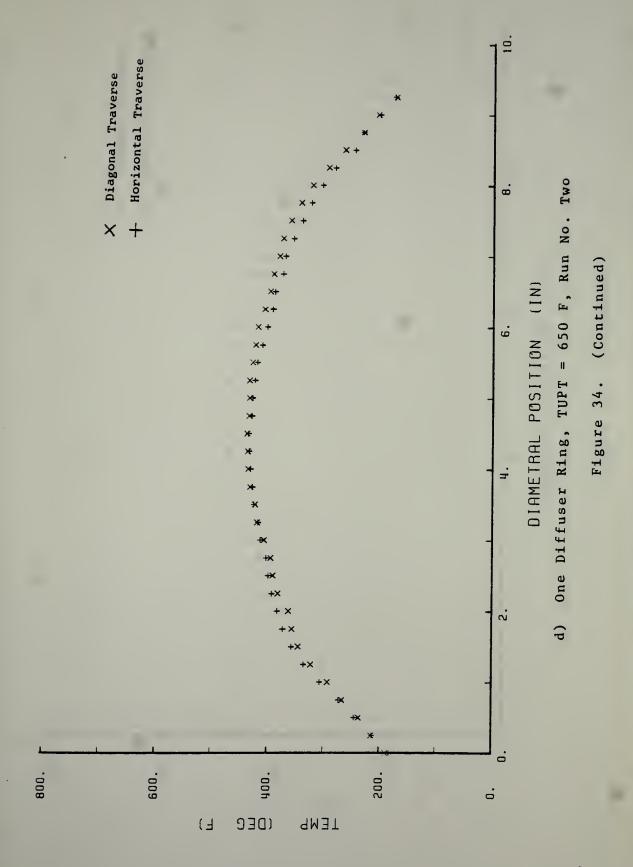




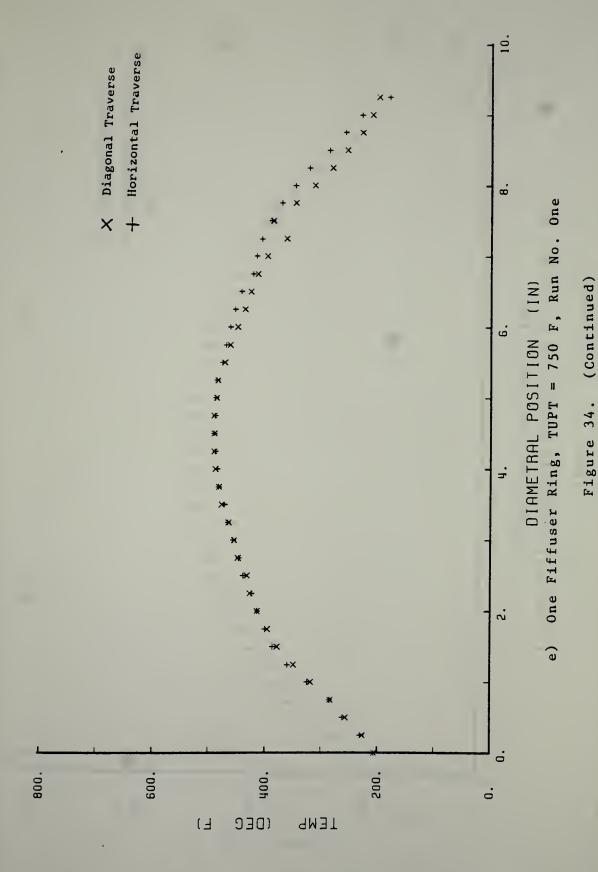




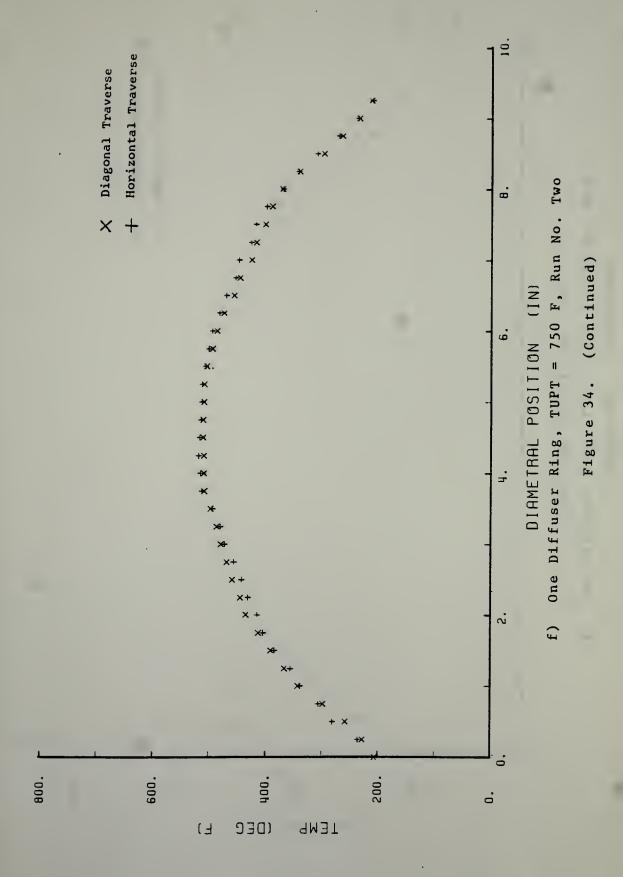




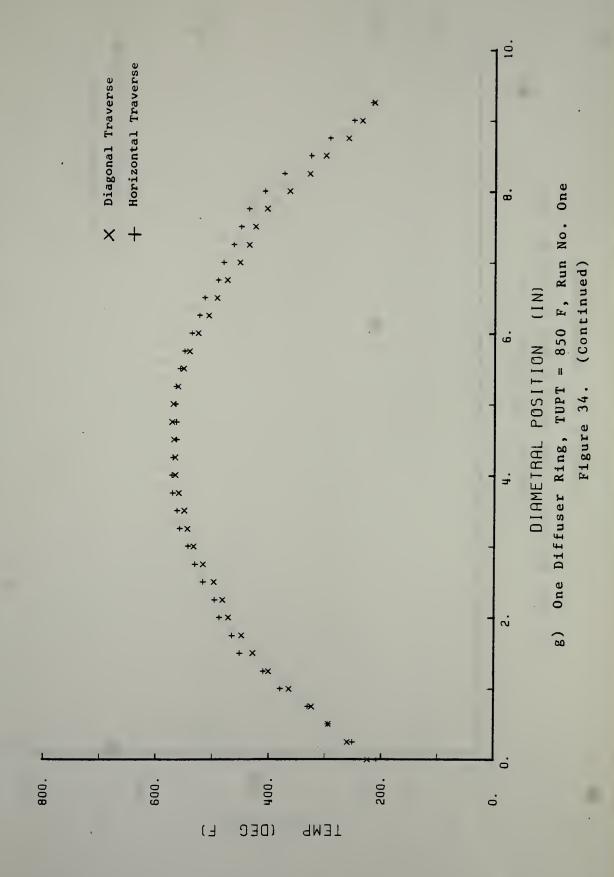




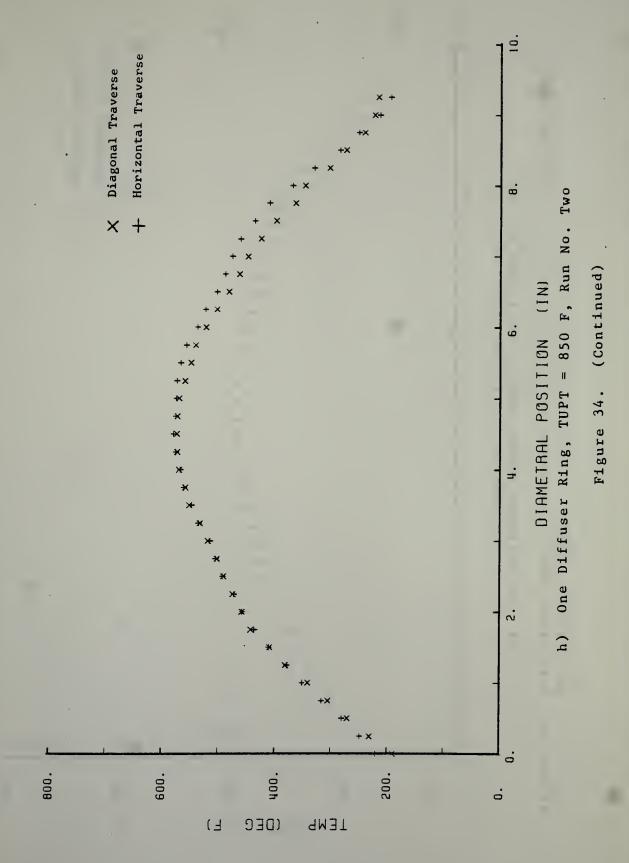




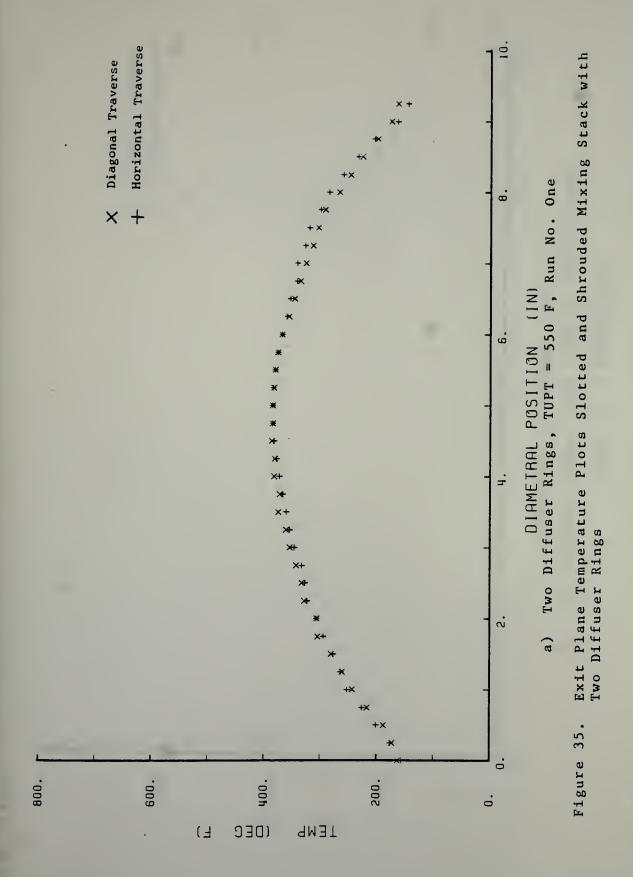




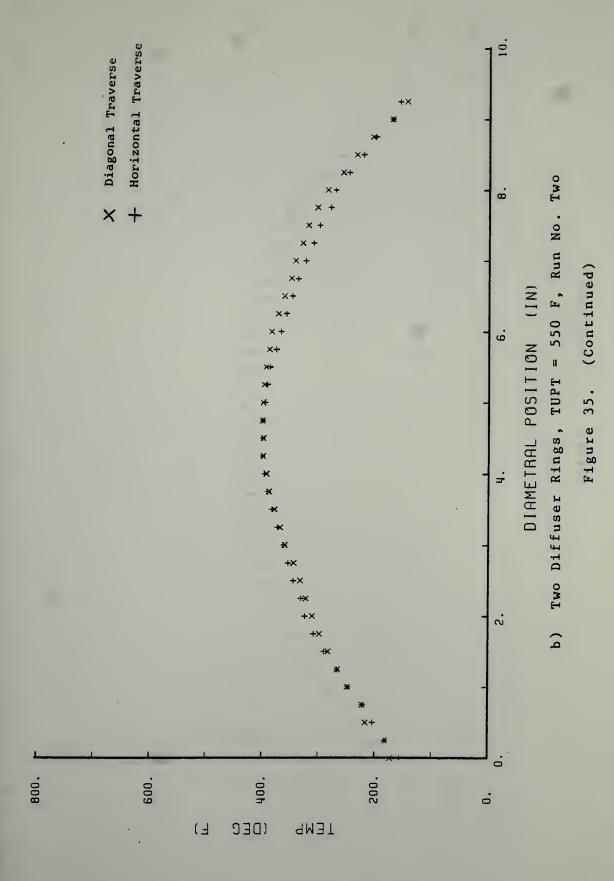




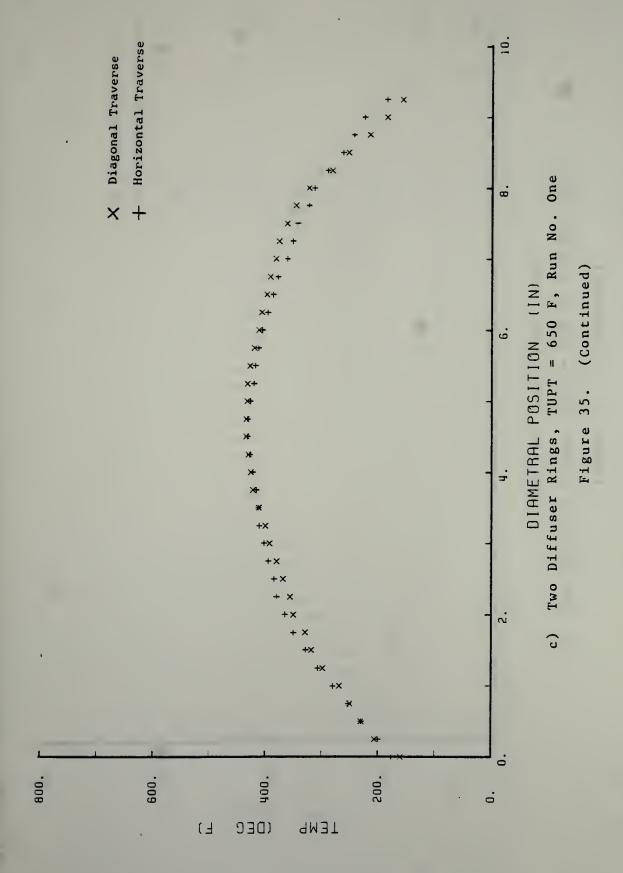




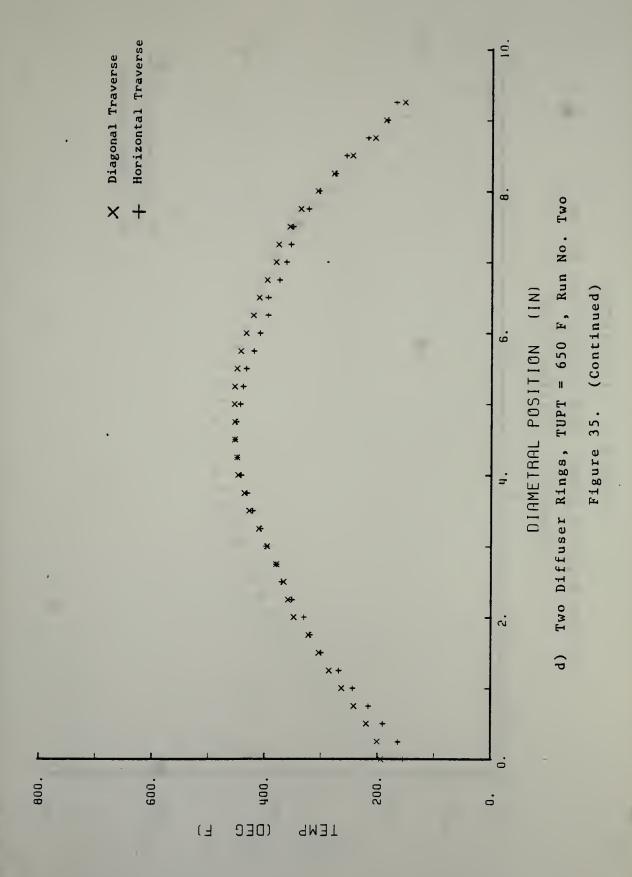




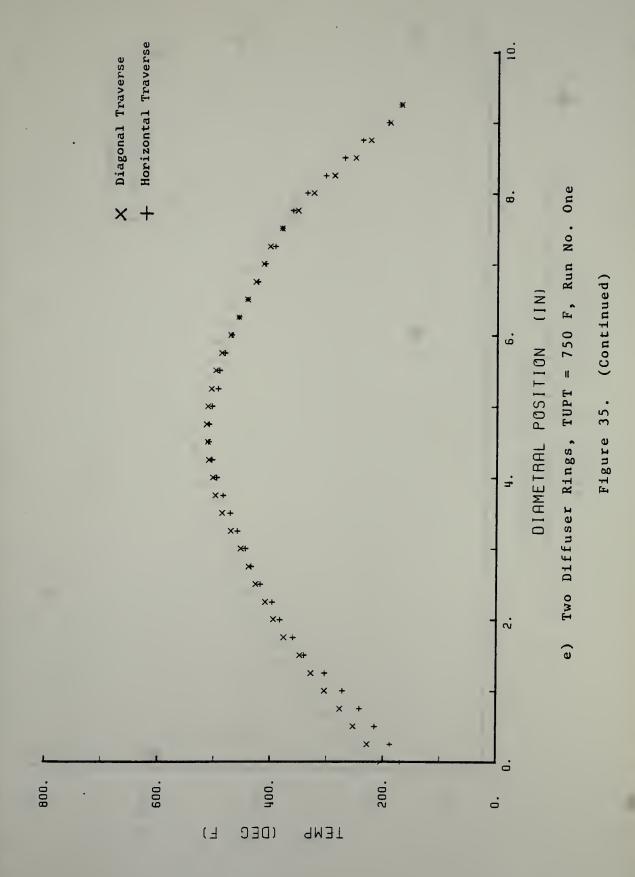




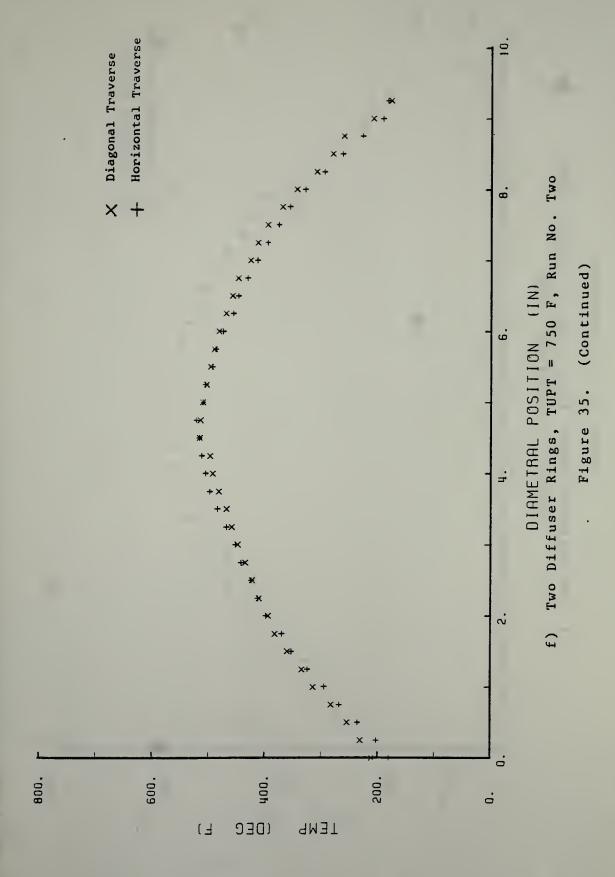


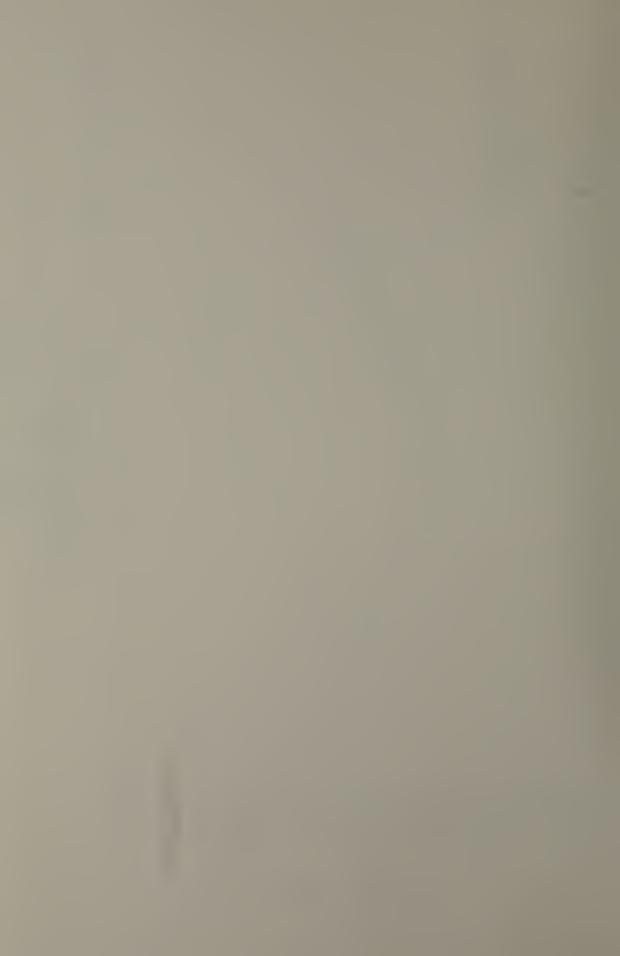


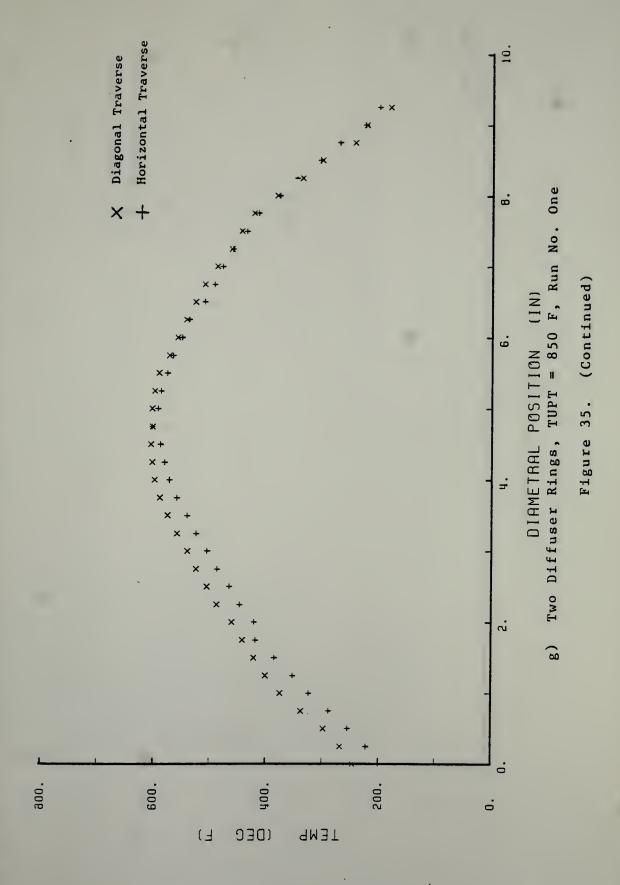




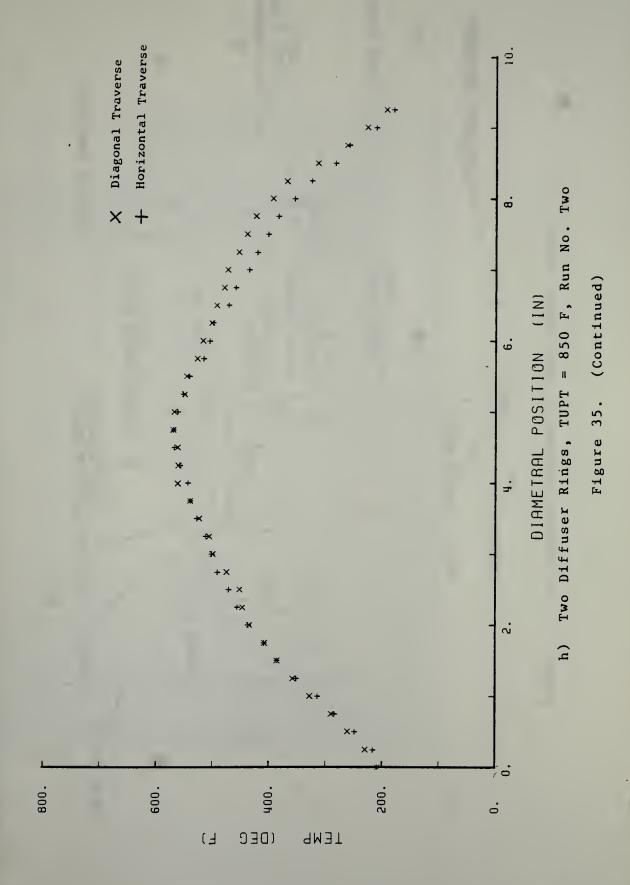














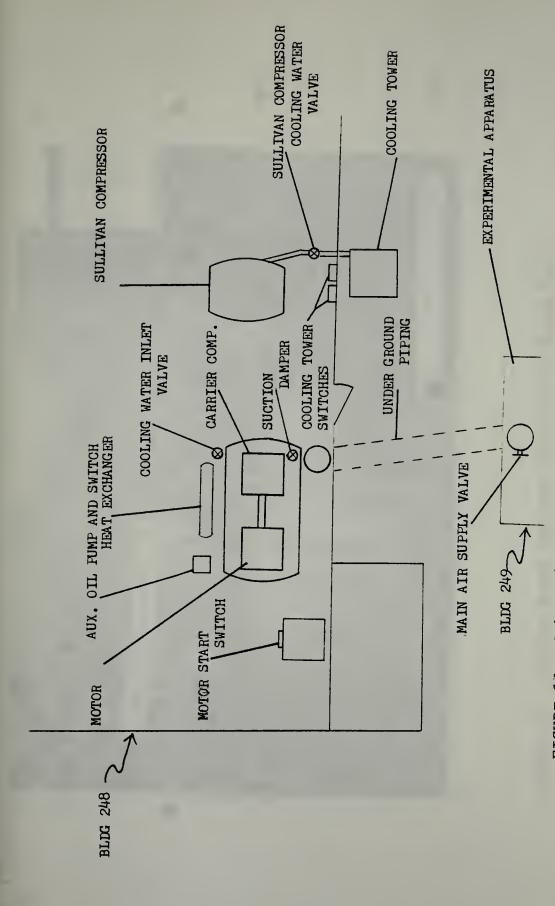
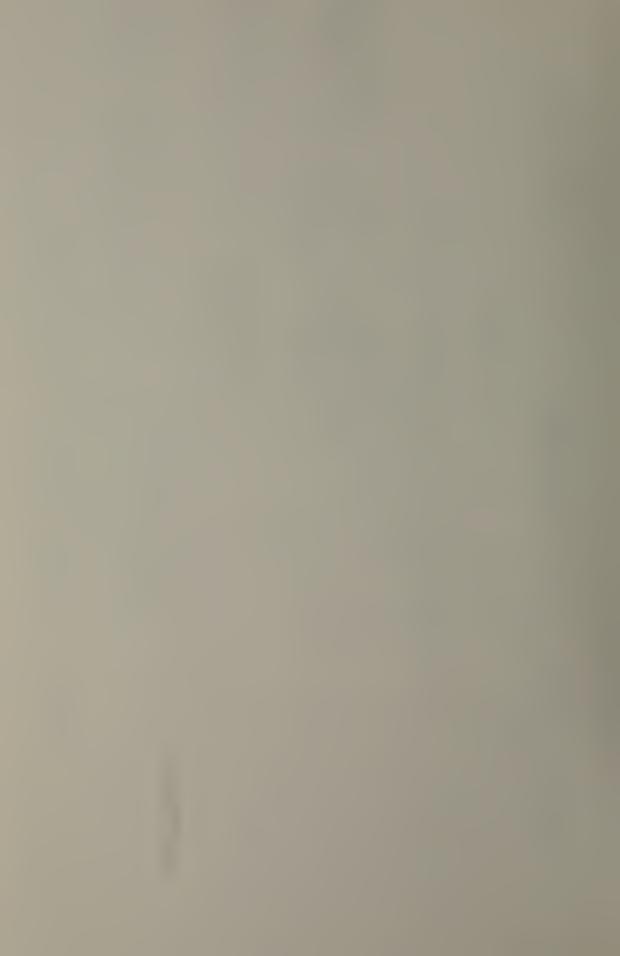
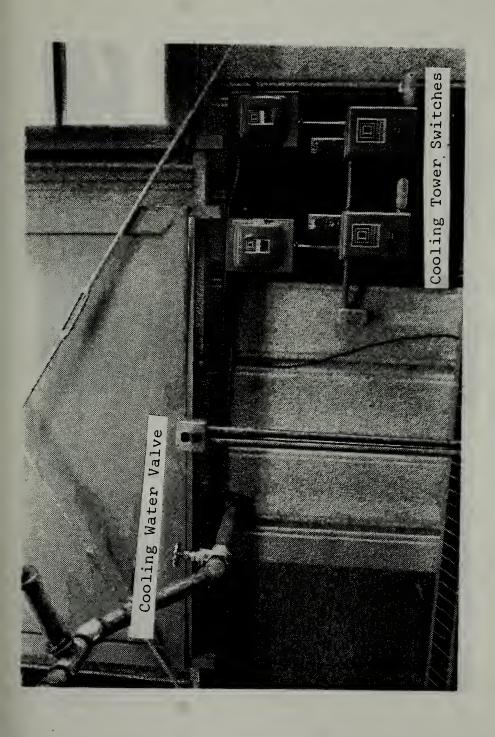


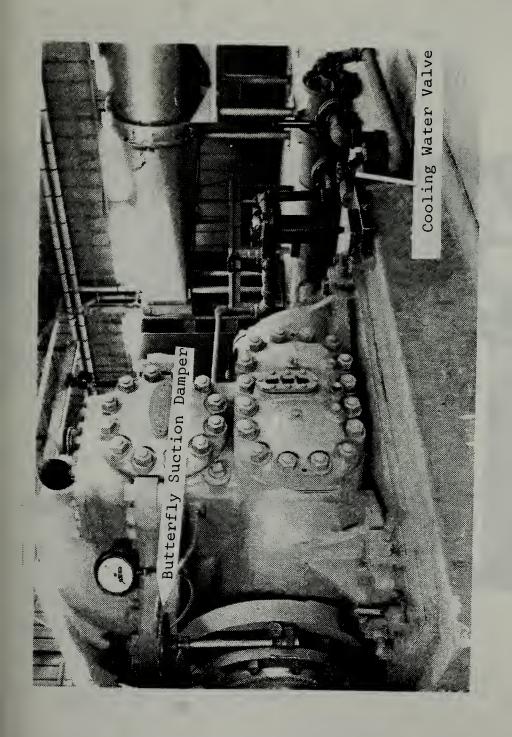
FIGURE 36, Schematic Diagram of Compressor Layout





Cooling Tower Switches and Cooling Water Valve FIGURE 37.





Carrier Air Compressor, Butterfly Suction Damper, and Cooling Water Valve FIGURE 38.



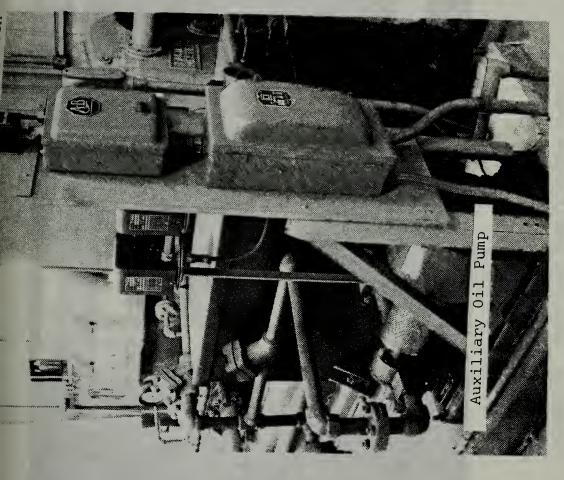


FIGURE 39. Auxiliary Oil Pump and Switch

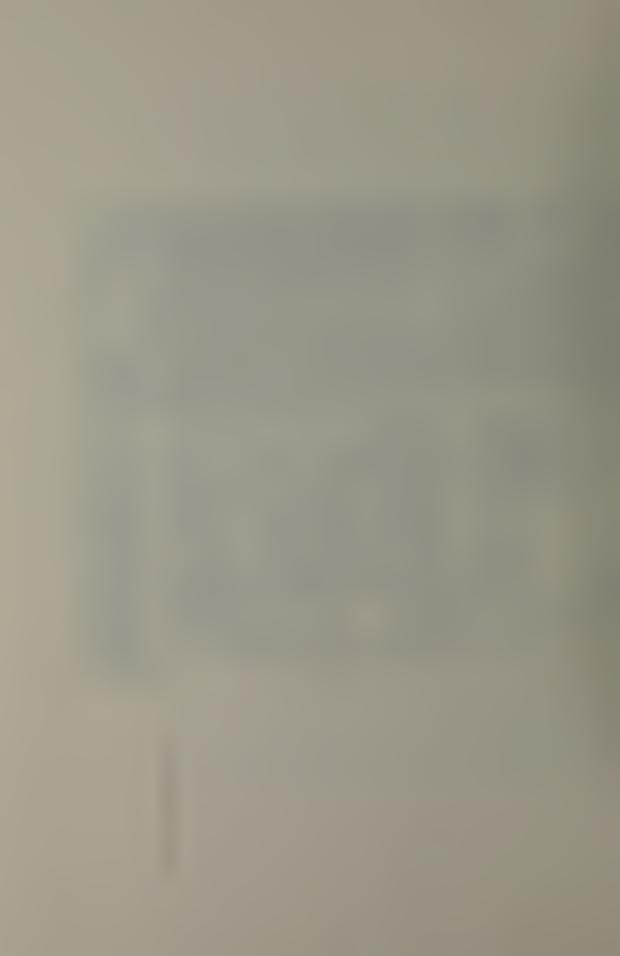


FIGURE 40. Main Air Supply Globe Valve



IX. TABLES

Two Diffuser Rings

Slotted and Shrouded Mixing Stack

One Diffuser Ring

Solid Wall Mixing Stack

oF)

Parameter (TUPT = 850

158	132	.74	10.0	580
138	144	.72	9.6	570
N.A.	N.A.	.53	0.6	604
	er			പ ത
Maximum Shroud Temperature (°F)	Maximum Diffuse Temperature (°F)	Pumping Coefficient	Back Pressure (in H_2^{O})	Maximum Exhaust Gas Temperature
	N.A. 138	N.A. 138	Sud N.A. 138 fuser N.A. 144	ser N.A. 138 N.A. 144 .53 .72 9.0 9.6

TABLE I. Summary of Results



												D 60	.054	.0 n 3	.053	.053	.064	.053	. 3638	.3638	.003	
												∃. L	114.0	112.3	112.2	112.3	112.5	112.6	112.1	112.1	112.1	
	.81 INCHES 7.122 INCHES INCHES HG											FT/7	129.2	143.7	150.7	155.3	162.7	165.9	166.3	167.7	**	
٠.	17-81 14CH	SEC AREA	0.0	6.283	11.152	14.726	27.293	35.859	52.425	64.992	* * * *	FT/S	323.7	320.6	320.1	320.5	321.0	321.2	319.9	319.9	319.7	
DATA TAKEN BY J A HILI	K LENGTH: K OLAWERER K L/O: TIO: SSURE: 50	PA-PS IN H20	1.70	2.30	1.55	1.24	0.59	.0.33	0.20	0.14	00.00	MeTe*.44	0.0	0.205	0.300	0.352	0.448	0.489	0.502	0.520	* * * * * *	
IT A TAKEN	XING STAC XING STAC SANDE STAC SANDOFF RA	PU-PA IN H20	6.30	07.7	8.40	8.80	9.30	9. 70	9.80	9.80	9.90	P*/T*	0.182	0.252	0.170	0.136	0.064	0.036	0.022	0.015	0.00.0	
ΔQ	ILINA MMM-3	TAM3 DEG F	17.0	6.47	72.0	74.0	75.0	75.0	75.0	75.0	11.0	* -	0.402	0.432	0.400	104.0	0.403	0.403	404.0	÷05°€	0.405	
		TUPT . DEG F	862.0	867.0	868.0	871.0	860.0	0.898	864.0	864.0	860.0	*	0.073	0.101	0.068	0.054	0.026	0.014	600.0	0°00e	000.0	
	I NCHE'	TRUNA DEG F	1323.0	1310.0	1297.0	1271.0	1248.0	1252.0	1234.0	1237.0.	1242.0	*	0.0	908.0	0.448	0.526	899.0	0.729	0.747	0.775	* * * *	
	+255 INC	FHZ HZ	125.0	124.0	125.0	125.0	125.0	126.0	124.0	125.0	1.25.0	LBMZ	0.0	0.321	174.0	0.553	107.0	0.772	0.61.0	0.820	* * *	
	2 50 IN	174F 066 F	168.3	170.6	171.4	171.8	174.8	175.2	176.0	1.971	1/8.2	LBM/S	1.368	1.052	1.051	1.051	1.358	1.058	1.057	1.057	1.356	
SI MAN 15	PPI WARY IN	CELPS IN H20	6.30	01.9	6.19	01.9	6.2)	6.23	6.20	6.20	6.2)	LAM/S	0.012	0.012	0.012	c.012	0.012	0.012	0.012	0.012	0.012	
o it: 31	HARER CF AKE DIA EA KATIC	P IH NO	4.10	4.30	4.30	6.30	04.4	4.4)	4.40	4.40	4.40	NPA LH4/S	1.355	1.040	1.039	1.035	1.045	1.046	1.345	1.045	1.043	
.3	CA: UZ	œ	_	7	71	,	2	د	2	20		œ	4	7	9	4		9	~	8	C.	

Performance Data, Solid Wall Mixing Stack Table II.

-0.080 -0.004 370.0 0.626

-0.320 +10°0-

-0.530 -0.123

""S, 14 H2C

MI MINS STACK DATA, DPEN TO ATMOT PHERE

360.0 0.618

0.590

3.429



ALPER	ALPER CF FRIMARY AC	Y ACZZLES:	•				UPTAKE GLAMETER: 7.51 INCHES	ETER: 7.	51 INCPES		
PRINCE	PRIPARY NCZZLE CIAMET PIXING STACK LENGTH:		17.81 INCHES	. s			AREA RATIC, JV/AF: 2.50		2.50		
A IX I A	FIXING STACK L/C: 2	2	1 (-12 INCHES				AMBIENT PRESSURE: 29.57 INCHES PG	SSURE: 2	9.57 INCHE	S F6	
z	FNF	DELPN	FFZ	TUPT	TAPB	PU-PA	PA-FS	SECCNEARY AREA	Y AREA	#FA	I.P.F
RLh	1A.HG	1A.H20	24	DEGRZES	:	INCHES	INCHES OF MATER	SGLARE INCHES	INCHES		LBM/SEC
-	3.70	90.9	164.9	654.0	65.3	5.60	3.38	•	0.0	1.0342	3.0104
2	3.60	6.05	104.0	656.0	65.0	7.10	1.58	•	6.283	1.0357	
C)	3.83	6.05	104.0	856.0	65.0	7.70	1.38	11	11.152	1.0361	0.0104
4	3.85	6.0.3	164.0	857.0	9.59	9.00	1.10	*1	14.726	1.0364	,c10.c
S	3.50	£.05	103.0	856.0	6.53	8 · 50	0.52	23	27.253	1.0371	0.0103
•	3.90	00.9	162.0	857.0	65.0	9.30	0.30	36	35.859	1.0330	0.0102
7	3.90	6.00	163.0	857.0	65.0	8.60	0.19	5.5	52,425	1.0330	0.0103
eu	3.90	00.9	103.0	857.0	65.0	8.50	0.13	64	64.552	1.0330	0.0103
U.	3°80	6.93	163.0	858.0	61.0	6.57	0.00		:	1.0330	
٠.	*	*	*	P+/1+	h+1++.44	3	84	d D	5	3	UPT HACH
ALB						L8H/SEC	LBM/SEC	F1/SEC	F1/SEC	F1/SEC	
7	0.0	0.1506	9662.0	0.3771	0.0	1.045	0.0	314.68	125.85	113.19	0.064
2	(.2893	0.0882	0.2588	0.2212	0.1530	1.046	0.303	314.52	146.23	113.13	0.064
•	C.4305	9.0618	0.3988	0.1549	0.2873	1.046	C.451	314.20	147.16	113.61	0.064
•	C.505¢	0.6492	0.3985	0.1235	0.3313	1.047	0.529	314.31	150.96	113.05	990.0
S	6.6439	0.5233	0.3968	0.0585	0.4257	1.047	0.674	313.82	157.69	112.67	0.043
•	1111.0	0.0133	0.3985	0.0335	9+14+0	1.043	C-142	312.60	160.42	112.44	0.063
_	9091-3	0.0086	0. 3985	0.C216	0.5007	1.043	C.783	312.55	162.37	112.42	2.063
•	1.7667	0.0058	0.3985	0.0146	0.5115	1.043	0.600	312.50	163.15	112.40	0.063
5	******	C •CC05	0.3979	900000	*******	1.043	******	312.88	*****	112.54	5.063

Table II. (Continued)

9 PCSITION A

PIXING STACK PRESSURE CISTAIBUTION FOR RUNS

394.0

369.0

336.0

-0.050

-0.050 -0.002 467.0

-C.325 -0.015

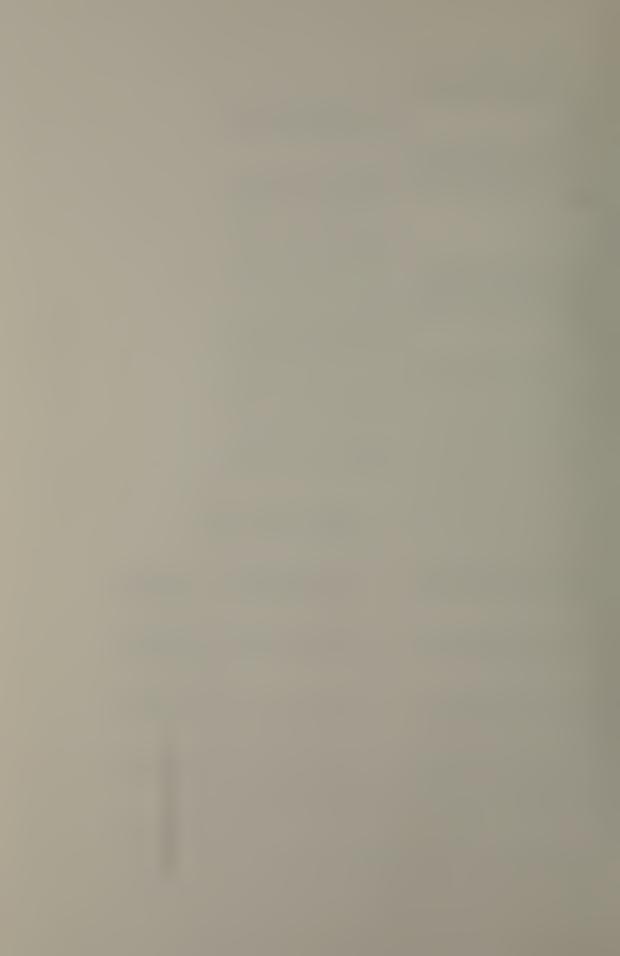
-0.540

FFSCIN. F2CI:

FPS+1

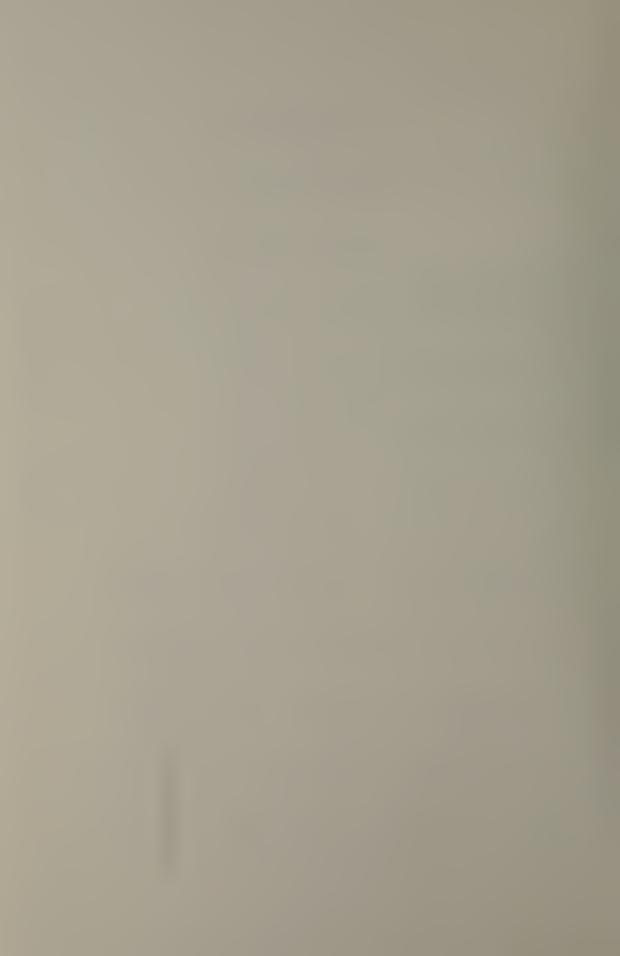
TPIX (CEG.F):

X/E1



									1,11,1	16.16.	0,000	3000	Fran.	2003	. On34	.0858	.0639	.0042						
									27. 17.8	74.0	75.4	18.4	78.0	18.1	14.3	16.1	74.3	75.6						
MUHSS Taches ES AS									15 ST	28.5	167.1	114.9	11.5.0	120.5	150.9	134.5	155.1	のなっては						
J. HILL FNGTH: 17.81 INCHES 17.45TT-50 10.50 10.50 10.50 10.00 10.	50 47FA 50 14 0.0	6.243	11.726	27.243	27.858	57.475	256.99	\$ 10 mm 1	275	1.1.5	226.1	324.5	234.4	224.0	321.6	275.0	225.6	357.1						
Y J HILL 11545TH: 61746TH: 170: 53.53	94-94 14 H29 5-40	2.65	3:1	0.65	0.43	`0.20	0.13	03)	945 - 4 × 1 × M	6	0.205	0.334	0.350	0.459	0.513	0.540	6.556	****						
A TEKITI SY THE STACK I THE STACK I HANGE STACK THE STACK THE PRESS.	PU-P8 17 HZ0 4.20	6.30	62.7	8.10	8.50	8.05	8.70	6.00	p=/12	0.4423	0.270	0.158	741.0	0.074	0.01	0.020	6.013	CCC. 0						
MILA ITA	TA19 663 6	f 2. U	,	63.0	6.1.0	70.0	70.0	73.0	: -	3.846	0.633	7,000	3.472	0.831	0.027	426.6	0.623	0.023						
	1921 066 6 184.0	179.0	1000	175.0	1.00.1	179.0	180.0	134.3	2	0.345	0.231	C. 108	0.123	0.061	9.455	0.323	0.016	0.000						
ç	152.0	157.0	156.40	165.6	100.0	16.05 -0	163.0	172.3	٤٠	0.0	3.442	1, 332	0.364	0.493	0.554	3.547	9.604	2 0 00 3		63	-0.160	-0.314	116.0	0.054
4 25 130 H30 H35	2H 2	0.0	;	2	د. د	0.0) •	o.°	2013	ر. د	6,900 13	227.0	1.6.02	6/17.1	163.	101.01	204.1	34 2. 4.	Cy High R	1.5	-0.410	-U.013	11.0	0.450
4 2 1125 2 1 1 2 4 2 2 4 2 4 2 1 2 1 2 1 2 1 2 2 2 2	Trust L G r 157.6	172.5	10.300	1/4.5] 3 1. 5 C	404.00	10401	1.5.0	1497.	1.744	1.055	1.018	1.50%	10001	1.546	1.340	זינין		s sends of the centers	1	-0.410	-6.603	165 00	11.1.7
2 ·	11 (1.7) 111 (2.1) 13.33	13.10	1.25.	i i	11	1,.10	17-15	12.43	# 1. %/1.	J. Outz	الماردول	ن،،ر در	J. 140	J. cald	bed av	0.00	Unit City	is out	J. TA . 19E	.7	L+1+0-	-0.00.	0.10	J.832
Diff: 22 Pri /6 Private CF Pri Bir P Pri Pack No. Zil 9 U Jennah Britanin 9 U Adim Sail 18 U WAR	9 2 3 4 5 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	7116	5.30	1. C. V	4.15	6.2.5	1.30	4.35	1 22 1	. 545	1. 356.1	1. 2/6	Person	1.541	4.240	954.1	1.5.1	1.044	SIALLS STACE	7	P45. It. HZU	FP 412	14 - 12	18319
3 20246	, s =	N in	· "	÷	٥	,	ŧ	•	3	4	~	•	*	33	J	~	פ	·*	3141				TMS	

Buf Pis Pishous



DATA TAKEN BY J A HILL

MIXING STACK LENGTH: 17-81 INCHES MIXING STACK DIAMETER: 7-122 INCHES MIXING STACK LOSMETER: 7-122 INCHES MIXING STATEMENT PRESSORE: 30-10 INCHES MG

NAME OF PRIMARY NOZZLES: 4
PAINARY NOZZLE DIAMETER: 2.25 INCHES
UPTAKE DIAMETEF: 7.510 INCHES
AAFA AATIO: AM/AP: 2.50

22 AUG 79

6.283

0.0

3.90 2.97 2.33 2.02 1.05 09-0

4-90 5.70 6.50

0.845 552.0 552.0 553.0 548.0 545.0 552.0 552.0 552.0

1438.0 1428.0 1405.0

78.0 8C.0 78.0 15.0 78.0 78.0 76.0 77.0 78.0

192.9 192.2 192.3 192.4

PNH IN HG 4.90 65.4 4.90 4.50 66.4

8.50 3.50

73.0 3.0 75.0 75.0 74.0 0.41 74.0 76.0

PA-PS IN H20

11.192

27.253 14.726

09.9 7.50

1428.0 1445.0 440.0 1433.0 0.0551 1412.0

192.5

8-50 6.50 8-40

8.50

192.3 191.9 190.0

192.5

4.90

4.50 4.50 05.4

52,425

7.70 8.00

64.992 ***

0.27 0.00

8.40

39.855

HOT RIG PERFORMANCE 1 OIFFUSER RING

Table III

Performance Data,

One Diffuser Ring

Slotted and

Shrouded Mixing

Stack with

122.5 121.1

6.46

95.4

123.0

122.1

58.2

88.1

2.50

2.06

1.60

1.50

1.40 222.0 195.0

1.20 149.0 168.0

1.00 136.0 144.0 78.9

6.75 134.0 110.0

0.50 116.0

0/x

TAS (POSITION A) THS (POSITION 8) SHRJUO (POSIT A) SHR JUO (FOSIT B) RING 1 (POSIT A) RING 1 (POSIT B)

17.0 168.0

MIXING STACK TEMPEPATURES (DEG FI, OPEN TO ATMOSPHERE

210.0 201.0

-0645

.0644

99.5 8.56 9.55 7.66 6.86 98.6 7.86 7.86

113.1 131.2 141.3 147.7 158.3 162.6 165.7 167.3 ****

283.9 283.3

> 0.226 0.356 0.436

> 0.315 0.248 0.215

0.0

0.415

0.529 0.527

0.220 0.166

0.0 * 3

0.0

1.223

1.215 1-216 1.216

126

0.299 .0.472

6.366 0.578 707.0 C.544 1.044 1.107 1.142

1.224

1.224 1.224 1.224

1.216

1.216 1.216 1.209 1.209

283.4 283.5 281.4 280.2 280.4 280.4 280.7

FT/S

55" ** L # M

*1/*d

*

L BM/S

L BM/S

LBM/S 0.008 0.008 0. COB 3.008 0.008 0.008 0.008 900.0

LEM/S

.0643 -0644 6690.

9.99-0 0.686 0.708

990.0

0.531

0.042

0.528 0.528 0.529

0.909 0.938

1.217 1.217 1.219

1.224

0.008

1.211

0.029 00000

0.584

0.113

0.531

0.528

0.113 090.0 0.034 0.022 0.015 0.000

0.578

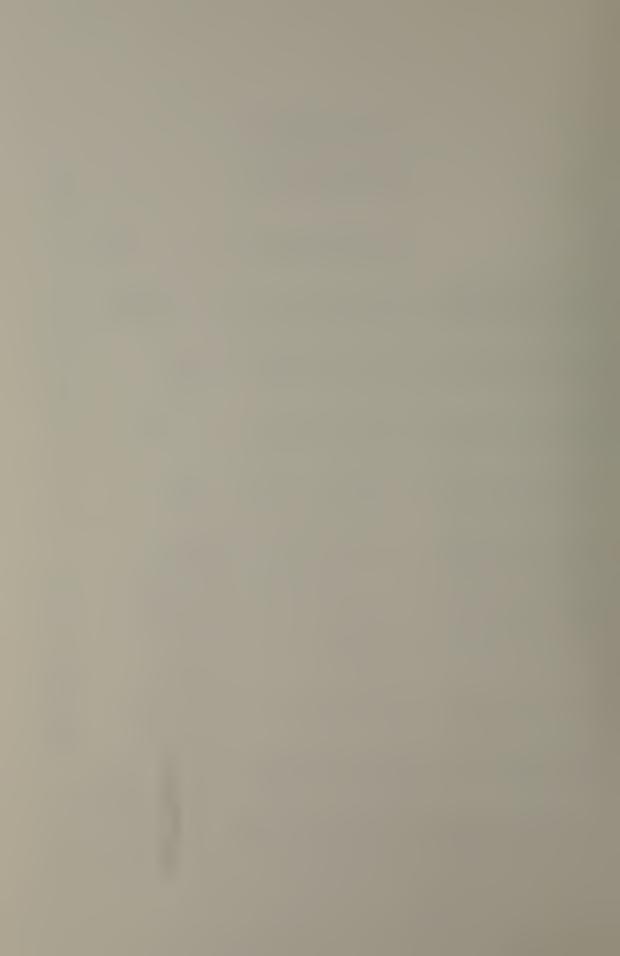
0.772 0.853

0.527

0.131

.0641

.0638 .0638

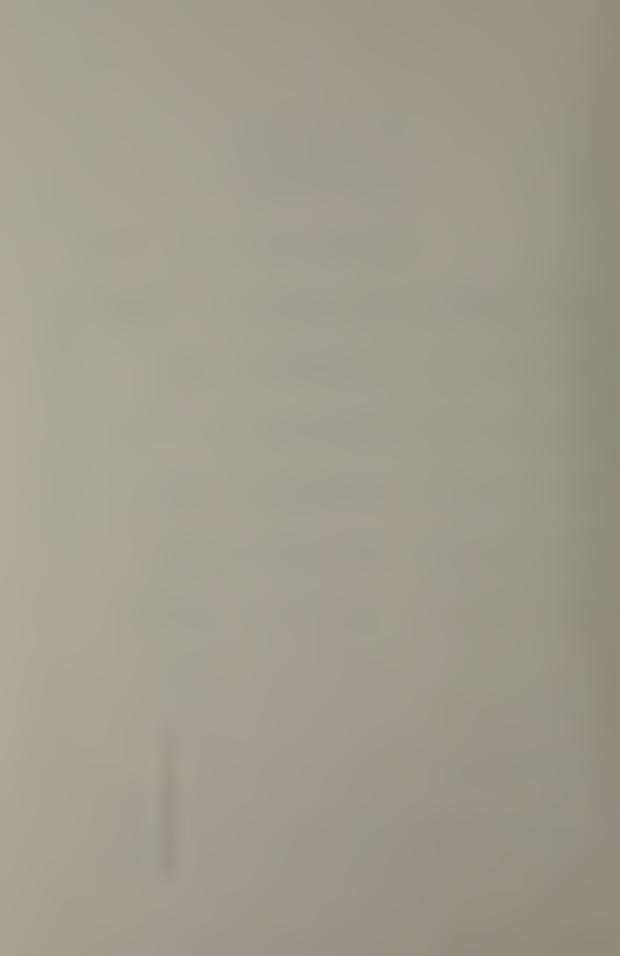


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GAMMA: 1.38	747: 6.50				ne	TANOOFF RI	STANOOFF RATIO: .50 AMBIENT PRESSURE: 30.08 INCHES HG	.08 INC	ES HG		
0 EL PN I N H20	TPRIH DEG F	FHZ	TBURN OEC F	TUPT DEG F	TAMB OEG F	PU-PA IN H20	PA-PS IN H20	SEC AREA			
1.50	150.0	78.0	1260:0	555.0	63.0	2.00	3.72	0.0			
7.50	154.5	78.0	1289.0	553.0	63.0	2.10	2.87	6.283			
7.90	155.8	76.0	1400.0	550.0	61.0	01.9	2.30	11.192			
8.00	157.1	76.0	1364.0	550.0	0.19	6.50	2.01	14.726			
8-00	158.5	15.0	1368.0	552.0	61.0	7.30	1.06	27.293			
6.60	155.3	76.0	1345.0	550.0	0.10	7.70	0.62	39.859			
8.03	160.4	76.0	1360.0	552.0	0.10	7.90	0.42	52,425			
9.00	161.0	76.0	1330.0	555.0	0.19	8.10	0.29	64-992			
6.00	163.8	76.0	1350.0	558.0	0.19	8.30	00.0	****			
WF L3M/S	LEN/S	LEMIS	* 3	*	*	b*/1*	4+T*W	UP FT/S	FT/S	FT/S	UMACH
0.008	1.220	0.0	0.0	0.204	0.515	0-396	0.0	284.5	113.6	100.0	.0645
900.0	1.215	0.303	0.299	0.159	0.516	0 - 309	0.224	282.3	130.1	5.56	.0642
0.003	1.214	0.581	0.478	C.128	0.516	0.249	0.357	280.8	139.8	98.8	.0639
0.038	1.215	C.714	0.588	0.112	0.516	0.217	0.439	280.8	146.1	98.8	.0639
0.603	1.215	195.0	151.0	0.059	0.515	0.115	0.590	280.8	157.7	98.8	.0638
0.008	1.215	1.674	0.884	0.035	0.516	0.067	099-0	279.8	162.6	98.4	.0637
0.008	1.214	1.162	0.958	0.023	0.515	0.046	0.715	279.9	166.8	98.5	.0636
900-0	1.213	1.197	0.987	0.016	0.513	0.031	0.736	280.5	168.7	98.7	.0637
0.338	1.212	* * * * *	* # #	000 0	0.512	000-0	* * *	280.9	****	6.86	-0637
STACK TEMPERA	PEFATURES (OEG F1, OPEN TO ATMOSPHERE	56 F1, OPE	EN TO ATM	SPHERE							
0/x	0.50	61.3	1.00	1.20	1.40	1.50	1.60	2.00	2.50		
THS (POSITION A)	112.0	129.0	122.0	130.0	196.0		197.0				
THS (POSITION B)	104.0	102.0	147.0	146.0	174.0		185.0				
SHR JUO (POSIT A)	62.0		64.1			73.5		.107.3			
(POSIT 6)	61.6		64.3			73.1		110.0			
(POSIT A)								90.08	107.3		
THE PERSONS											

(Continued)

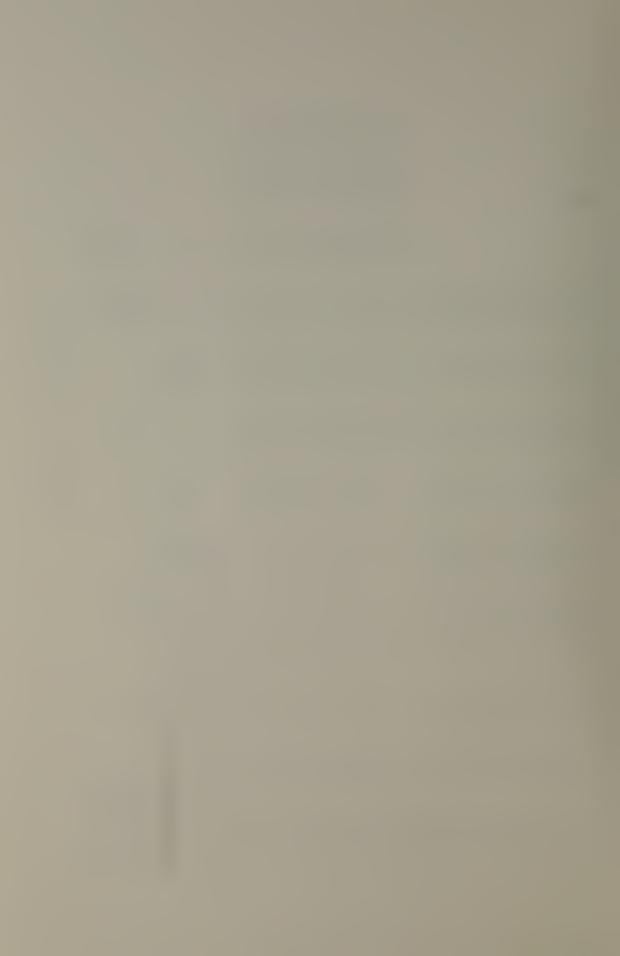
Table III



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TAKEN
DATA

													OM M	-064	-063	.063	.063	.063	.063	.063	.063	-064								
												į	FT/S	104.4	104.0	103.7	103.2	1.63.1	103.1	103.0	103.9	103.6								
	NCHES INCHES											į	FT/S	118.6	135.5	145.2	150.6	161.7	167.3	171.4	173.5	****		2.50					127.9	133.0
_	17.81 50 50 10 INCH	SEC AREA	0.0	6.283	11.192	14.726	27.253	39.859	52.455	64.952	*****	9	FT/S	297.1	295.7	294.1	293.3	293.1	293.0	293.0	295.8	294.4		2.00			132.2	133.7	101-0	102-1
BY J A HILL	CK LENGTH: 17-81 INCHES (CK LIA4EER: 7.122 INCHES (CK L/O: 2.50 ATIO: 30.10 INCHES HG	PA-PS IN H20	3.68	2.81	2.22	1.90	. 66*0	65.0	0.40	0.27	00.0	1	** * * * * * * * * * * * * * * * * * *	0.0	0.223	0.353	0.430	0.575	0.648	669.0	0.709	* * * * *		1.60	226.0	224.0				
DATA TAKEN BY	MIXING STAC MIXING STAC MIXING STAC STANOOFF RA AMBIENT PRE	PU-PA IN H20	2.00	5.70	6.20	6.50	7.40	7.80	8.10	8.70	8.50	1, 40	• / • 4	0.397	0.304	0.241	0.207	0.108	0.064	0.043	0.029	000-0		1.50			94.2	93.5		
70	IZZNĄ	TAMB DEG F	75.0	75.0	75.0	15.0	75.0	75.0	15.0	75.0	0.77	;	<u>:</u>	0.477	0.478	624.0	0.481	0.481	0.481	0.484	624.0	0.485		1.40	247.0	217.0				
		TUPT OEG F	0.299	658.0	0.959	652.0	652.0	653.0	0.579	0.959	646.0		:	0.189	0.145	0.115	0.100	0.052	0.031	0.021	0.014	0.000	SPHERE	1.20	162.0	187.0				
	INCHES	TBURN DEG F	1410.0	1430.0	1450.0	1449.0	1450.0	1452.0	1450.0	1480.0	1476.0	*	• •	0.0	0.308	0.488	0.594	0.794	0.895	0.962	0.980	* * * *	MIXING STACK TEMPERATURES (DEG F), OPEN TO ATMOSPHERE	1.00	154.0	171.0	85.9	83.2		
		FHZ	0.55	0.95	0.45	85.0	65.0	0.55	0.45	95.0	65.0	.1	LBM/S	0.0	0.356	0.563	C-685	6.517	1.034	1-120	1.140	* * * * * * * * * * * * * * * * * * * *	G F1, OPE	61.3	151.0	122.C				
	10 2 2 ES: 2, 25 16 TER: 10 10 CHES	TPNH CEG F	164.4	184.9	165.1	165.5	185.3	185.8	186.0	186.2	187.4	0	LEM/S	1-153	1.154	1.154	1.154	1.150	1.155	1.164	1.164	1.170	TURES (DE	0.50	134.0	0.211	80.0	18.1		
22 AUG 79	ERY OF FKI WARY CENTONETER FILE FATIONS AMAP:	OEL PN I N H20	7.70	7.70	7.70	7.70	7.70	7-70	7.80	7.80	9.00	u 3	LBM/S	500.0	0.010	9.009	600.0	607.0	600.0	697.0	900 °C	600 0	TEMPERAL	d/x	ON A)	(8 NC	T A }	T 8.1	[T A)	T 63
DATE: 22	ALTA PA OF ALTA PATA PATA PATA PATA PATA PATA PATA	Pr.H IN HG	3.60	3.70	3.70	3.70	3.60	3.40	3.90	3.90	3.50	707	LBM7S	1.144	1.145	1.145	1.144	1.140	1.146	1.155	1.154	1.161	ING STACK		THE (POSITION A)	THS (POSITION B)	SHRJUO (POSIT	SHRIND (POSIT	RING 1 (POSIT A)	RING 1 (POSIT B)
۵	20 240	Z,Z	-	7	'n	4	S	9	1	9	9	2	£	-	~	6	4	S	9	-	α)	6	× I H		T-45	THS	SHR	SAR	Z Z	212

Table III (Continued)



MIXING STACK LENGTH: 17.81 INCHES MIXING STACK DIAMETER: 7.122 INCHES STACK L/O: 5.50 TAIL STACK L/O: 5.50 AMBIENT PRESSURE: 30.08 INCHES HG

6.283 11.192

0.0

3.60 2.78 2.22 1.89 0.98

5.10 5.60 6.20 6.50 7.40 7.80 8.00 8.20 8.30

63.0 63.0 63.0 63.0

650.0 650.0 650.0 650.0 650.0

1338.0 1322.0 1319.0 1310.0 1340.0 1326.0 1321.0

83.0

174.4

4.30

4.30 4.30 4-40 7.4 04.4 4.40 4.40 4.40

SELPN IN H20 7.50 7.50 7.50 7.50 7.50 7.50

Prh IN HG

83.0 83.0 83.0

174.2

173.8 173.6 173.4 172.7 172.2 171.7 107.2

TBURN OEG F

NJMBER OF FRIMARY NUZZLES: 24
PRIMARY DIOZZE 01AMETER: 2.25 INCHES
MACKER DIOZZE 01AMETER: 7.510
INCHES
GAMYA: 1.34
GAMYA: 1.34

23 4JG 79

PA-PS IN H20

27.253 14.726

39.828 52.425 64.952

63.0 63.0

650.0

63.0

83.0

83.0

63.0 63.0

651.0 0.659 652.0

1330.0

1335.0

£3.0

0.37 0.27 ***

.0640 .0639 .0638 .0639 .0638 .0637 .0638

103.7 103.6 103.5 103.6 103.4 103.3 103.4 103.2 103.2

117.8 134.7

295.1 294.5

0.0

0.471 0.471

0.183 0.142

0.0

0.0

1.157 1.157

LBM/S

LEM/S

LAM/S 0.008 0.008 0.008 0.008 0.008 0.CO 8 9.008 0.008 0.008

LBM/S

129

0.309

0.358

*1/*d 0.389 0.301 0.241 0.204

150.6 161.3 166.6

294.4 293.8 293.7 293.9 293.4 293.2

0.428 0.571 0.641 0.673 0.713 ****

> 901-0 0.063 0.040 0.029

0.050 0.030 0.019

0.096

965.0 0.795 0.893 0.938 0.993

159.0 0.923 1.036

144.7

294.2

0.353 0.222

> 0.471 0.471 0.471 0.471 0.471 0.471 0.469

0.113

.0.492

6.569

1.158 1.160 1.160 1.160

1.150

1.151

1.152

1.149

1.149

.0636 .0637

172.0 1691

000-0

0000.0

1.158

1.149

0.014

1.089 1.153

1.161 1.161

1.153 1.153

1.152

2.50

2.00

1.60 219.0 208.0

1.50

1.40 215.0 203.0

1.20 140.0 174.0

> 137.0 163.0

140-0 0.75

122.0

123.0 127.0

THS (POSITION B) THS (PCSITION 4)

SHROUD (POSIT A)

RING 1 (POSIT A) SHRJUO (POSIT B)

RING 1 (POSIT B)

63.3 63.2

65.8 9.59

MIXING STACK TEMPERATURES (DEG F), OPEN TO ATMOSPHERE

DATA TAKEN BY J A HILL

**

HOT RIG PERFORMANCE

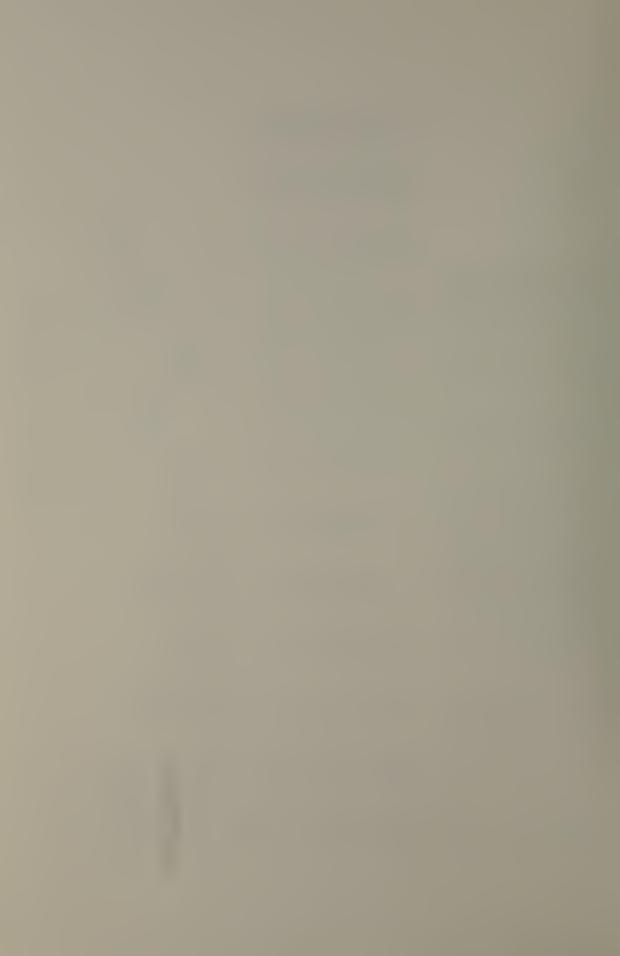
Table III

1111.7 118.2

83.3

112.1 111.7

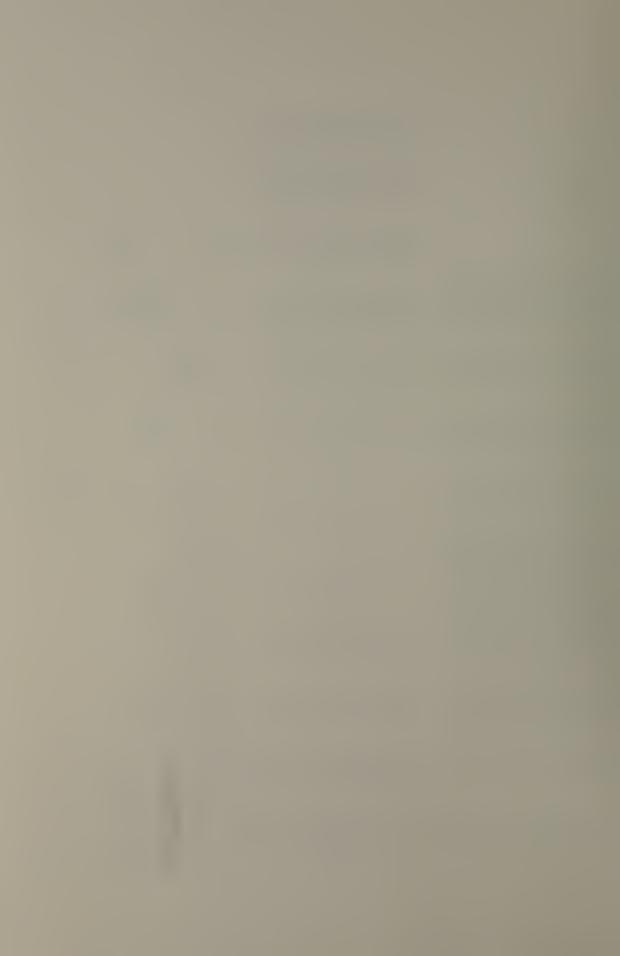
76.2 75.6 (Continued)



										FT/	108	108	108	108	107	107	108	107.	107.							•	
INCHES TNCHES HES HG										FT/S	122.8	140.1	149.7	155.6	165.5	170.9	174.8	174.8	****		. 2.50					132.3	142.0
17-81 50 50 1NCI	SEC APEA	0.0	6.283	14.726	27.293	39.859	52.425	64.952	****	UP FT/S	307.6	308.3	307.3	307.3	305.9	305.5	306.9	304.3	305.9		2.00	•		136.2	132.4	103.5	103.6
BY J A HILL K LENGTH: K DIAMETER: K L/O: 5.5 TIO: 50.5	PA-PS IN H20	3.52	2.71	1.84	96.0	0.56	0.37	0.25	00.00	******	0.0	0.220	0.349	0.425	195.0	0.635	829.0	769.0	* * * *		1.60	252.0	242.0				
DATA TAKEN BY JA HILL MIXING STACK LENGTH: 17-81 INCHES MIXING STACK DIAMETER: 7-122 INCHES MIXING STACK DIAMETER: 7-122 INCHES MIXING STACK DIAMETER: 530-10 INCHES HG	PU-PA 1N H20	5.30	5.90	6.70	7.50	7.90	8.10	8.20	8.50	P*/T*	0.382	0.294	0.234	0.200	901.0	0.061	0.040	0.027	00000		1.50			4.96	95.5		
D IZENA	TAMB OEG F	14.0	74.0	74.0	14.0	0.47	0.42	0.47	72.0	<u>*</u>	0*4*0	0.438	0.439	0.439	0*4*0	0.440	0.438	0.441	0.440		1.40	248.0	246.0				
	TUPŤ OEG F	753.0	758.0	756.0	753.0	752.0	758.0	750.0	750.0	*	0.168	0.129	0.103	0.088	0.046	0.027	0.018	0.012:	000 0	SPHERE	1.20	0.991	217.0				
INCHES	TRURN OEG F	1465.0	1470.0	1465.0	1460.0	1458.0	1460.0	1448:0	1435.0	* *	0.0	0.316	0.502	0.611	0.813	0.912	0.974	956.0	* * * * *	MIXING STACK TEMPERATURES (OEG F), OPEN TO ATMOSPHERE	1.00	178.0	202.0	83.9	84.2		
	FHZ	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	L BM/S	0.0	0.350	0.555	0.675	0.899	1.663	1.078	1.058	* * * * *	G F1, OPE	6.15	174.0	128.0				
OATE: 22 AUG 79 HJPBER DE PRIMARY NDZZLES: 4 P3JMAKY NGZLE OIAHETER: 2.26 UPJTAKE OILMETER: 7.510 GAMHAR: 1.57	TPNH DEG F	182.2	182.0	181.0	180.8	180.5	130.2	180.3	176.5	LBM/S	1.105	1.105	1.106	1.106	1.106	1.106	.1.106	1.105	1.111	TURES (OF	05.0	152.0	120.0	61.2	80.4		
AUG 79 PRI MARY 522LE OIA EMETEF:	JELPN I N H20	7.00	7.00	2.00	7.00	7.00	7.00	7.00	7.00	WF LAM/S	0.010	0.010	010.0	010°C	0.010	0.010	010.0	0.010	0.010	K TEMPERA	0/X	GN A)	ON B	IT A)	1T 5.)		1T 8.)
OATE : 22 NUMBER DF NAMEN NO UPTAKE OIL SANYA: RATIO	Prin IN HG	3.70	9.70	3.70	3.70	3.70	3.70	3.60	3.63	LER/S	1.095	1.095	1.096	1.056	1.056	1.050	1.650	1.095	1.101	KING STAC		THS (POSITION A)	THS (POSITION	SHE JUD (POSIT			RING 1 (POSIT
O La Julio	2	-	N . K	1 4	S	9	7	æ	6	差	7	7	71	4	S	3	~	00	0	¥.		×	H	SH	SH	2	ix I

.0640 .0641 .0639 .0637 .0637 .0638

Table III (Continued)



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0.801 9-80 9-80 08.5 6.801

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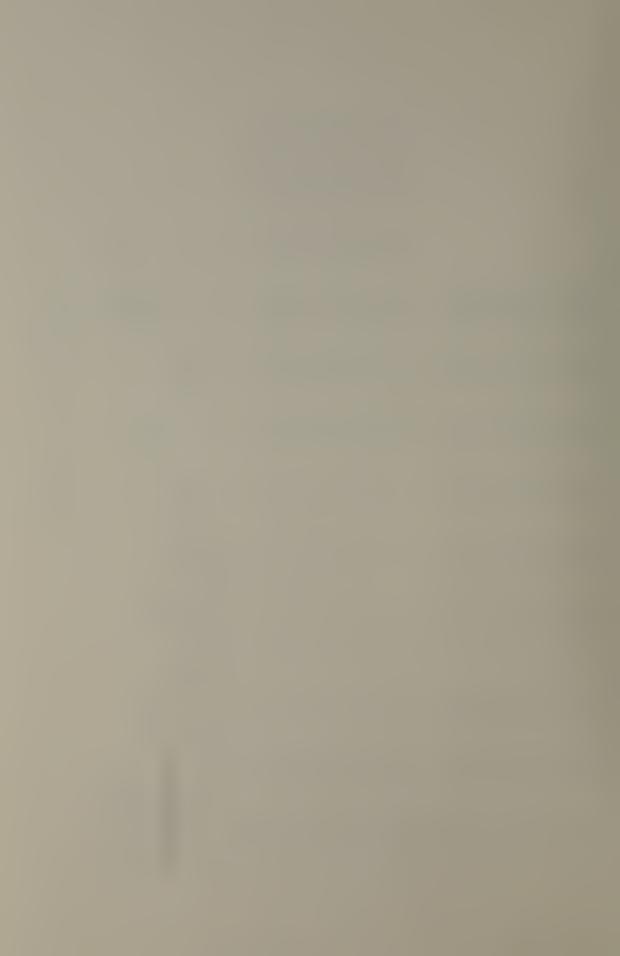
08-0

.0642

08.4 08.2 08.3

> 114.0 126.1 2.50 120.7 121.0 99.3 1001 2.00 1.60 248.0 239.0 1.50 82.4 82.2 1.40 242.0 237.0 1.20 154.0 219.0 MIXILG STACK TEMPERATURES (DEG FI, OPEN TO ATMOSPHERE 1.00 173.0 185.0 70.0 71.0 6.15 125.0 166.0 0.50 66.6 149.0 122.0 67.3 TMS (POSITION A) SHRJUD (POSIT A) SHEJUD (POSIT B) RING 1 (POSIT A)

(Continued) Table III



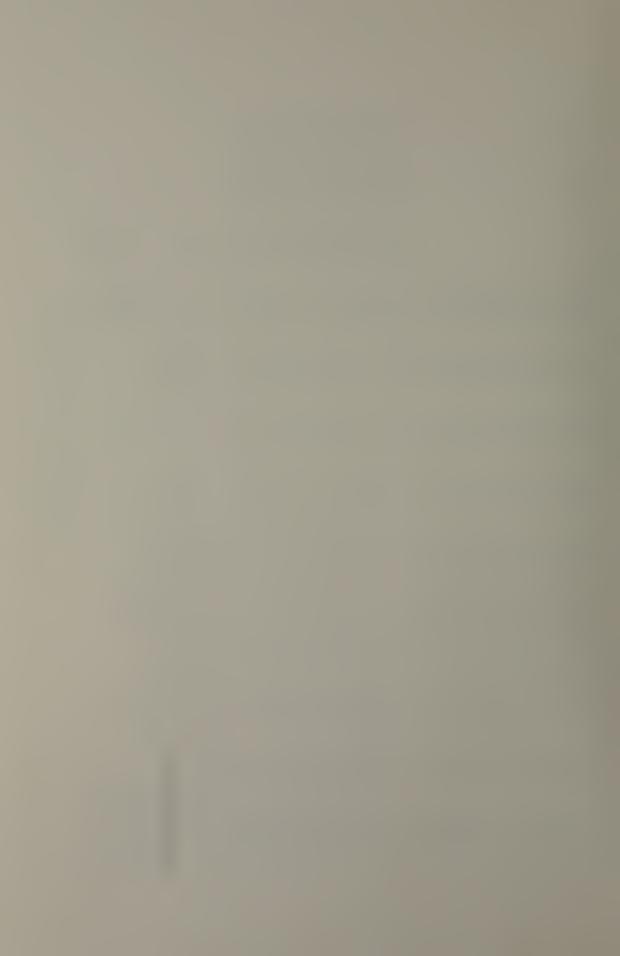
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DATA TAKEN BY J A HILL	MIXING STACK LENGTH: 17.81 INCHES HIXING STACK LOTHER 7.122 INCHES	AMBIENT PRESSURE: 30.10 INCHES HG
DATE: 22 AUG 79	PRIMARY NO	64FMA: 1.30

												UMAC	.064	.064	.064	.064	.063	.063	£90 ·	.064	.064
												FT/S	112.4	112.3	112.2	112.1	111.7	111.2	111.3	112.0	112.4
INCHES	INCHES HG											FT/S	127.9	144.6	154.3	159.8	169.4	174.0	177.3	179.4	****
L 17.81 INCH	50 -10 INCH	SEC AREA	0.0	6.283	11.192	14.726	27.293	39.859	52.4.56	64.992	* * * * * *	UP F T / S	320.4	320.1	319.7	319.6	318.2	316.9	317.1	319.1	320.0
DATA TAKEN BY J A HILL MIXING STACK LENGTH: WIXING STACK OFAMETER:	K L/0: 2.	PA-PS IN H20	3.42	2.65	2.10	1.78	06.0	0.53	0.35	0.24	00.00	55"**1*M	0.0	0.218	0.347	0.420	0.554	0.622	0.664	0.677	****
ATA TAKEN IXING STAC IXING STAC	IXING STAC TANDCEF RA MBIENT PRE	PU-PA IN H20	6.10	06.9	7.40	7.70	8.50	8.80	8.90	9.00	9.00	P*/T*	0.369	0.280	0.228	0.193	960.0	0.058	0.038	0.026	000-0
o es	IN∢	TAMB OEG F	70.07	70.0	70.0	0.07	70.0	70.0	0.07	0.07	71.0	*	0.405	0.404	0.404	0.404	0.405	0.406	0.405	0.405	0.405
		TUPT DEG F	848.0	850.0	852.0	853.0	849.0	846.0	848.0	847.0	852.0	* Q.	0.149	0.116	0.092	0.078	0.040	0.024	0.015	0.010	000 •0
ÆS		TBURN DEG F	1266.0	1284.0	1285.0	1293.0	1265.0	1249.0	1244.0	1252.0	1282.0	*	0.0	0.325	0.517	0.626	0.824	0.924	0.988	1.008	* * * *
S: 4 INCHES		FHZ	109.0	108.0	167.0	107.0	167.0	105.0	104.0	104.0	106.0	WS LBM/S	0.0	6.347	0.550	6.467	619.0	C.585	1.052	1.080	* * * *
DZ ZL ES:	2.50 INC	TPNH CEG F	160.2	160.8	162.6	163.2	163.5	164.6	165.0	165.9	168.4	NP S/MP 1	1.068	1.067	1.065	1.065	1.066	1.065	1.065	1.072	1.072
22 AUG 79 OF PRIMARY NO	METEF: 7	UELPN IN H20	02.0	6.20	6.20	07.9	6.20	6.20	6.20	6.30	6.30	LAM.S	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010
DATE: 22 NUMBER OF PRIMARY NO	2746 614 464 24110 4744: 1.	P 24 HG	4-26	4.20	4.20	4.20	4.30	4.30	4.30	4.30	4.40	Lows	1.057	1.056	1.055	1.054	1.055	1.055	1.054	1.062	1.061
م جن	ਹੋ ਕਲੇ																				

	,								
0/4	04.0	c	1.00	1.20	1.40	1.50	1.60	2.00	2.50
TMS (POSITION A)	176.0	206.0	214.0	177.0	264.0		254.0		
THS (POSITION B)	124.0		229.0	245.0	265.0		266.0		
SHROUD (POSIT A)	61.6		85.6			66.3		138.4	
SHR JUD (POSIT &)	81.7		86.0			98.2		138.2	
RING 1 (POSIT A)								103.5	134.
KINS 1 (POSIT 83)								110.4	144.2

(Continued) Table III



LL 17.91 INCHES R: 7.122 INCHES 1.50 0.08 INCHES HG	SEC AREA SO IN	0.0	6.283	11.152	14.726	27.293	39.859	52,425	64.952
RY JA HI	PA-PS 1N H20	3.32	2.59	5.09	1.75	0.89	0.53	0.04	0.26
DATA TAKEN BY JA HILL MIXING STACK LENGTH: MIXING STACK L/O: 2.5 STANDGFF RATIN: .50 AMBIENT PRESSURE: 30.	PU-PA IN H2D	6.30	06.9	7.40	01.7	8.50	8.80	6.90	9.10
22207	TAM8 DEG F	0.19	61.0	0.19	0.19	0.19	0.19	61.0	62.0
	TUPT DEG F	856.0	0.098	852.0	0.008	960.0	0.858	652.0	0.098
E	T BURN DEG F	1292.0	1286.0	1280.0	1281.0	1280.0	1293.0	1296.0	1294.0
25 INCHES	FH2 F72	105.0	102.0	102.0	102.0	101.0	101.0	0.66	101.0
	TPNH OEG F	181.8	182.0	182.0	181.7	181.6	182.0	182.6	183.0
23 AUG 79 OF FRIMARY NO NOZZLE DIAME DIAMETEF: TIO. AM/AP:	DELPN IN H20	6.30	6.30	6.40	6.40	6.30	6.30	04.0	0.40
OATE: 23 PRIMAFY OF COATAKE NE GAMARY ALI	IN HG	4.30	4.30	4.30	4.36	04.4	94.4	04.4	4.40
0 50240	Œ.	-	~	m	4	5	9	~	ď

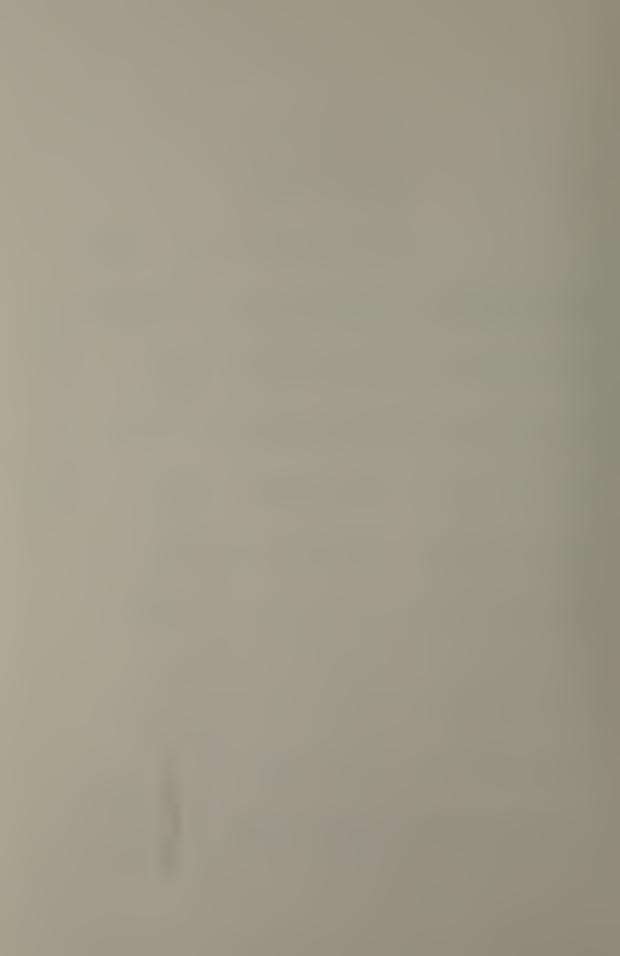
	UMACH	.0640	.0640	- 0642	.0644	.0639	.0638	.0640	.0642	.0638	
	FT/S	112.2	112.3	112.4	113.0	112.1	111.8	112.0	112.7	111.9	
	FT/S	127.7	144.3	154.2	160.3	169.3	174.2	177.0	181.9	* * * *	
*****	FT/S	319.9	320.2	320.3	322.1	319.4	318.5	319.1	321.0	318.9	
0.26	N*T**.44	0.0	0.217	0.346	0.415	0.552	0.622	0.652	0.705	****	
9.10	P*/1*	0.362	0.282	0.226	0.188	160.0	0.058	0.037	0.028	00000	
62.0	<u>*</u>	0.396	0.395	0.397	0.395	0.395	0.395	0.397	0.395	0.396	
860.0	* a	0.143	0.111	0.000	0.074	0.038	0.023	0.015	0.011	00000	
1294.0	* 3	0.0	0.327	0.519	0.625	0.831	0.937	0.980	1.061	****	
101.0	LBM/S	0.0	6.346	C-554	0.666	C. E81	0.993	1.046	1.133	****	
183.0	LEMZS	1.059	1.059	1.067	1.067	1.060	1.060	1.067	1.067	1.064	
6.30	LBM/S	0.010	0.010	3.010	0.010	0.010	0.010	0.010	0.00	010.0	
4.60	MPA LEK/S	1.049	1.046	1.057	1.057	1.050	1.050	1.058	1.057	1.054	
יס סי	4	~	7	m	•	S	9	7	70	O.	

×	0/x	0.50	67.3	1.00	1.20	1.40	1.50	1.60	2.00
THS (POSITION A)	A.)	164.0	176.0	194.0	164.0	265.0		256.0	
THS (POSITION 8)	9	119.0	124.0	201.0	245.0	267.0		262.0	
SHEJUO (POSIT A)	4.	45.6		73.0			86.2		125
SHADUD (POSIT B)	8.	9.59		12.9			85.8		124.8
KING 1 (POSIT A)	A.)								10
RING 1 (POSIT B)	9								110

Table III (Continued)

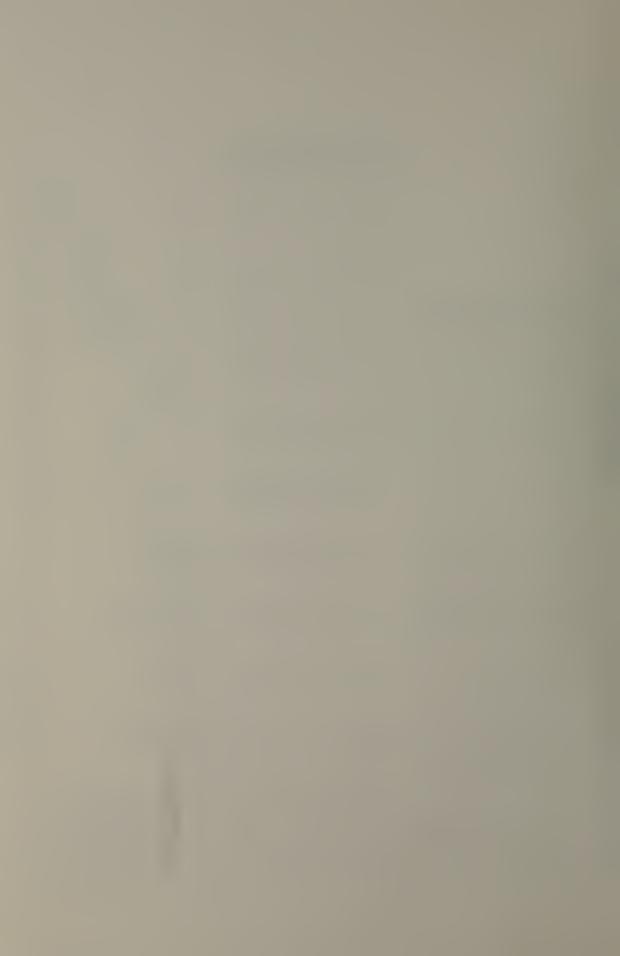
121.6 128.9

2.50



												UMACH	.0642	.0641	1,900	6690.	0 990	.0639	6690.	.0639	.0638											
												FT/S	5.55	66.5	4.56	55.5	66.5	0.56	99.5	1.66	99.1		2.50		•					100.4	111.3	with
	NCHES INCHES ES HG											FT/S	113.2	129.4	139.0	144.1	156.7	162.4	166.4	168.1	****		2,25					108.4	104.6	113.7	98.4	Stack
	17-81 1 50 50 06 1 NCH	SEC AR EA	0.0	6.283	11.192	14.726	27.293	39.859	52,425	64.992	**	UP FT/S	283.6	283.7	283.4	282.6	283.3	282.1	282.4	282.4	282.3		2.00			124.5	125.0	51.2	89.1			Mixing
Y J A HILI	MIXING STACK LENGTH: 17-81 INCHES AND	PA-PS IN H29		2.42	1.97	1.67	0.95	0.58	C. 39	0.27	00.00	75° ** LeM	0.0	c. 204	0.329	966.0	0.556	0.635	0.684	902.0	****		1.60	198.0	198.0							
A TAKEN BY	CING STACK CING STACK CING STACK NOCFF RAT	PU-PA 1 N H2C	06.30	7.00	7.40	21.1	8.30	8.70	8.90	00°6	9.20	P */T*	0.337	0.259	0.211	0.179	0.102	0.062	0.042	0.029	00000		1.50			92.4	92.3					Shrouded
DATA	ELINA HUMPA	TAP8 OEG F	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	*	0.523	C. 522	0.522	C.523	C.522	0.523	0.522	0.522	0.522		1.40	175.0	158.0							ed and
		TUPT OEG F	556.0	558.0	558.0	556.0	559.0	556.0	558.0	558.0	959.0	* d	0.176	0.135	0.110	0.094	0.053	0.033	0.022	0.015	000-0	SPHERE	1.20	136.0	185.0							Slotted
	ŧES	T 8U PN DEG F	1012.0	1022.0	1 01 5.0	1018.0	1022.0	1015.0	0.9001	1020.0	1014.0	* 3	0.0	0.272	0.437	0.530	0.740	0.844	0.911	0.539	* * * * * *	RATURES (OEG F), OPEN TO ATMOSPHERE	1.00	***	154.0	78.3	78.6					Data,
	HES INCHES	FHZ	73.0	13.0	13.0	73.0	73.0	73.0	73.0	73.0	73.0	MS LBM/S	0.0	0.331	0.532	949-0	0.900	1.027	1.108	1.143	各	F), OPE	0.75	146.0 *	124.0							mance
	87 NJ ZZL ES: 2.25 DIAMETER: 2.25 : 7.510 INCHES	TPNH OEG F	190.0	190.0	190.0	190.1	190.0	190.4	190.8	190.8	191.4	L P.1/S	1.21 €	1.216	1.216	1.216	1.217	1.217	1.217	1.217	1.216	TUPES (DEC	0 • 50	71.0	****	75.0	74.8					Performance
ALG 79	Z mirr z	OFLPN 14, 427	7. 20	7.20	7.20	7.20	7.20	7.20	.2	7.20	7.20	L E4/S	1000	200.0	0.007	0.307	0.007	C.007	0.007	0.007	0.007	TEMPE	0/x	N A 3	a	IT A3	T 81	T A1	T 9.1	-	∃ E	IV.
04TE: 17	NIMBER CF PRI FRIMARY NGZZI LOTEKE DIME CAMMAR INS	PN4 11 HG	16.60	10.60	10.60	16.60	10.70	16. 76	10.70	10.70	10.70	WPA Lav/S	1.209	1.209	1.205	1.208	1.210	1. 210	1.209	1.209	1.209	XINS STACK		NOI II SCa)	THE (PCSITION	TESCA) DECEMB	SHROUD (POSIT	3 1 (PGS1T	-	2	NG 2 (F751T	able I
0	\$4545	æ	-	7	6	4	.ب	9	7	œ	\$	œ Z	-	2	m	4	2	•	7	80	σ	ž		T4S	3	SHE	SHR	RI NS	5 ING	StaT d	- C	Ŧ

Two Diffuser Rings



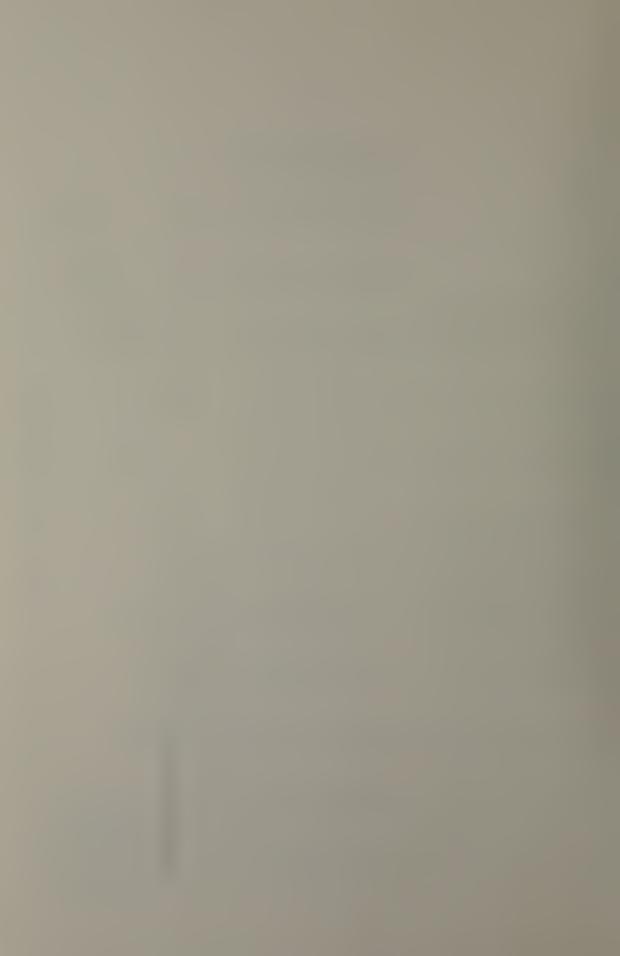
DATE: 18 AUG 79

											UMACH	.0640	•0639	.0640	.0638	•0638	.0639	-0645	**90*	.0644			
											F. I'S	99.3	99.1	95.1	98.9	98.7	9.35	9.66	99.1	95.1		2 50	7 • 7
7-81 INCHES 7-112 INCHES 13 INCHES HG											FT/S	112.7	128.8	139.1	144.2	156.0	163.5	168.7	171.8	*		3, 6	(3,6)
ER: 17-81 12: 2-50 30-03 INCI	SEC AREA	0.0	6.283	11.192	14.726	27.293	39.859	52.425	64.992	**	FT/S	282.4	281.8	281.7	281.2	280.5	280.9	283.3	282.0	281.7		2.00	>> · v
K LENGTH: K OIAME TER K L/C: 2 TI C: 50 SSURE: 30	PA-PS IN HZC	3.32	2.50	2.10	1.75	0.97	0.02	0.42	0.31	00.00	55. ** T* M	0.0	0. 209	0.340	014.0	0.564	0.658	c. 705	0.751	* * * *		1.60	7
XING STAC XING STAC AND CFF RA PIENT PRE	PU-PA IN H20	5.30	00.9	6 • 30	09.9	7.40	7 .80	8.10	8.30	8 .30	p*//*	0.359	0.271	0.227	0.190	0.105	190.0	0.044	0.033	000.0		1.50) :
EAENG HUMPE	TAMB DEG F	0.07	76.0	70.0	0.07	76.0	0.07	70.0	70.0	0.69	<u>*</u>	0.521	C.521	0.524	0.522	C. 525	0.525	0.526	0.529	0.528		1.40	
	TUPT OEG F	557.0	557. C	552.0	555.0	549.0	550.0	549.0	545.0	541.0	*	0.187	0.141	0.119	0.099	0.055	0.035	0.023	0.017	0.000	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.20) (
I NC HES	180 PN 3EG F	1292.0	1296.0	1262.0	1263.0	1264.0	1264.0	1222.0	1236.0	1228.0	* 3	0.0	0.279	0.453	0.546	0.749	0.873	0.935	965 0	* * *	FI. OFFN TO ATMOSPHERE	1.00	
2 -25 INC	FH Z HZ	78.0	78.0	78.0	78.0	70.0	16.0	15.0	15.0	75.0	Law/s	0.0	0.337	0.550	099.0	0.911	1.064	1.151	1.226	# # #	. F.I., OFF	0.75	0 00.
17 22L ES: 4E T E	TPNH DEG F	195.4	195.4	195.4	195 •3	195.3	155.3	195.3	195.2	194.0	1 P S 1 S	1.208	1.208	1.214	1.209	1.216	1.218	1.231	1.233	1.234	TURES (DEG	0.50	
F OR 14ADY 1642 E DIAN 1642 FF 3 : 101 647 AD :	OELPN IN H27	8.70	8.79	8.60	0.40	8.80	8.80	60.6	6.03	60.6	L EM/S	0.009	9.00.0	C-038	0.008	0.038	6.008	9000	0.008	0.008			
SANTARES SAN	PN4 IN HG	3.46	3.40	3.40	3.50	3.50	3. 60	3.60	3.70	3.70	1 5 7 5 7 S	1.200	1.200	1.207	1.202	1.208	1.210	1.224	1.226	1.227	N N3 STACK TEMPERA		.01410001 3
5000 A13	œ	-1	2	173	4	15	9	-	9	S	α	7	2	3	4	2	9	2	8	0	-		1

97.0 11111 110.6 115.2 131.2 91.3 89.9 130.1 210.0 195.0 91.7 92.1 218.0 193.0 145.0 170.0 156.0 146.0 76.0 128.0 129.0 113.0 *** 73.0 THS (POSITION AI (8 TISC9) 1 3!!! 9) RING 2 (POSIT A) FING 2 (07SIT E) THE (PEST TION BI SHECHO GENETIT AL SHEDUD (POSIT 8) KINS I (FCSIT AL

Table IV. (continued)

95.1 110.4



0ATE: 17	17 ALG 79					Õ	ATA TAKEN	DATA TAKEN BY JA HILL	ור			
PALWBER CF PALWBER CF COTE A B B B B B B B B B B B B B B B B B B	F D 9 1 4 8 9 4 9 2 2 L ES: 10 2 2 L E 5 1 A 9 E 7 5 1 1 N 1C 3 A 7 A P: 7 2 5 0	19 2 ZL ES:	ES: 25 INCHES	Inches		Z2ZN4	MIXING STACK MIXING STACK MIXING STACK STANDOFF RATI	K LENGTH	CK LENGTH: 17-81 INCHES CK L/C: 2.50 ATIO: 50.0¢ INCHES HG ESSUR E: 20.0¢ INCHES HG	I NCHES Z INCHES HES HG		
P N4	OEL PN IN F20	TPVH 050 F	FHZ	1811RN 0.6G F	TUPT OEG F	TAMB OEG F	PU-PA IN H20	PA-PS	SEC AREA		٠	
22.66	7.80	152.7	80.0	1166.0	642.0	72.0	7.60	3.15	0.0			
5.00	7.80	192 .8	80.0	1168.0	0.449	12.0	7.70	2.41	6.283			
2.00	7.80	193.2	81.0	1175.0	646.0	72.0	8.10	1.94	11.192			
5.00	7.80	193.0	80.0	1172.0	645.0	72.0	8.40	1.65	14. 726			
5.10	7.80	193.0	80.0	1170.0	0 * 4 4 9	72.0	. 01.6	0.91	27.293			
5.10	7.80	192.9	80.0	1170.0	645.0	72.0	9.40	0.55	39.859			
5.10	7.80	132.9	81.0	1172.0	645.0	72.0	9.60	. 76.3	52,425			
5.10	1.80	192.5	81.0	1178.0	0.649	72.0	9.70	0.26	64.992			
5.10	7. 80	193.1	81.0	1190.0	0.159	72.0	06*6	00.0	****			
FPA LBV/S	WF LPY/S	L B4/S	MS TBW/S	*	å	*	*1/*d	55° ** 1*M	FT/S	FT/S	UE FT /S	S A A
1 1.166	C. C08	1.174	0.0	0.0	0.161	0.483	0.333	0.0	297.1	118.6	163.9	ò
1.166	0.008	1.174	0.330	0.281	0.123	0.482	0.255	C. 204	257.1	134.7	104.1	90
1.166	B 00°0	1.174	0.528	0.449	0.099	0.481	0.205	0.326	297.2	144.3	104.1	90.
1.166	0.039	1.174	0.640	0.545	0.084	0.481	0.175	0.395	256.8	145.6	104.0	.06
1.168	900.0	1.176	0.881	0,749	0.046	C. 482	950.0	0.543	256.4	161.0	103.9	•0
991.1	0.308	1.176	1.000	0.851	0.028	0.481	0.058	0.617	296.4	166.8	103.9	90.
1.168	0.008	1.176	1.079	0.918	0.01	0.481	560.0	0.665	296.3	170.5	103.8	•00
1.168	0.038	1.176	1.122	0. 554	0.013	C. 480	0.027	0.690	297 .4	173.0	104.2	•0•
3 1.108	0.008	1.176	* * *	* * * *	00000	624.0	00000	* * *	557.6	***	104.3	•0•
AI'IG STAC	AI'IG STACK TEMPE9ATUPES (OEG F), OPEN TO ATMOSPHERE	TUPES (OF	G F), OP	EN TO ATMO)S PHERE							
	0/x	0.50	0 .75	1 .00	1.20	1.40	1.50	1.60	2.00	2,25	2.50	
4S (POS IT INV A)	ON A)	71.0	154.0	165.0	140.0	220.0		214.0		-		
NOILISOA) SP	6	***	125.0	168.0	210.0	221.0		218.0				
TRUC (PAS I	IT 41	15.5		79.5			95.5		132.5	•		
TISOA) ONCE	IT 8.)	15.5		80.2			95.8		129.3			
INS 1 (POSIT	IT A)				•				54.5	114.2	•	
INS 1 (POSIT	IT EJ								92 .5	114.6		
113 2 (PDSIT	1 T A)									119.9	104.5	
ING 2 (POSIT	17 E)									103.0	116.9	

)643 |644 |644 |643 |642 |643 |643

Table IV. (Continued)



147-510 INCHES 17-510 INCHES 17-510 INCHES 18-5-50 INCHES 18-50 INCH	1A"B DEG F 67.0 67.0 67.0 68.0 68.0 68.0 68.0 68.0 68.0 67.0 68.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 69.0 67.0 69.0 69.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0 69.0 67.0	1A"B DEG F 67.0 67.0 67.0 68.0 68.0 68.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0	1A"B DEG F 67.0 67.0 67.0 68.0 68.0 68.0 68.0 68.0 68.0 67.0 68.0 67.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0	1A"B 57.0 67.0 67.0 68.0 68.0 68.0 68.0 68.0 68.0 67.0	14"B 06"0 67.0 67.0 68.0 68.0 68.0 68.0 68.0 67.0 68.0 67.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0 68.0 67.0	14"B 06"6 67.0 67.0 68.0 68.0 68.0 68.0 67.0	7 A B B B B B B B B B B B B B B B B B B	1A"B 51.0 67.0 67.0 68.0 68.0 68.0 68.0 68.0 68.0 68.0 68.0 68.0 68.0 68.0 67.0	1 A.B BEG F 67.0 67.0 68.0 68.0 68.0 68.0 68.0 68.0 68.0 67.0 67.0 67.0 67.0 67.0 67.0 67.0 67	18 AUE 79	ς ,	771 65:				o z	TA TAKEN	OATA TAKEN BY JA HILL MINING STACK SENGTH:	וור	200041
FHZ JEURN TILPT TAWB BEGGF BEG	1A"B 67.0 67.0 67.0 67.0 68.0 68.0 68.0 68.0 66.0 67.0	PP47 TPNH F FHZ TBURN FHZ THUR FHZ DEG F F DEG F DE	PPH L LPA FHZ DEC F L DEC F	DEL PM 1 TPN H FLZ TBURN FLZ TATO 647.0 67.0 7.50 184.2 83.0 1271.0 645.0 67.0 7.60 184.2 83.0 1272.0 648.0 68.0 7.60 184.2 83.0 1272.0 645.0 67.0 7.60 183.3 1272.0 645.0 68.0 7.60 183.3 1272.0 645.0 68.0 7.60 183.3 1272.0 645.0 68.0 7.60 183.0 1272.0 645.0 68.0 7.60 183.1 83.0 1272.0 645.0 66.0 7.60 183.2 1274.0 646.0 68.0 67.0 7.60 183.1 83.0 1278.0 647.0 66.0 7.60 183.1 1.20 0.20 0.169 0.476	DEL PHY LOSE LEG F FHZ LPHY LAG BAGO LEG F THDPF LPHY LEGG F THPP LPHY LEGG F THPP LPHY LEGG F DEG F LPHY LEGG F	DEL PHY LONG FHZ LPHY LEW LA FHZ LPHY LPHY LA FHZ LPHY LPHY LPHY LA FHZ LPHY LPHY LPHY LPHY LPHY LPHY LPHY LPHY	DEL PHY OFFILE HAZ DEG F INDER	DEL PHY LAGE THY LAGE	DEL PHY LAGE PEG F PHZ LAGE PEG PHZ LAGE	35.00	AN USER OF SHARP AN USE OF SHARP AND STEE OF SHARP AND STEE OF SHARP STEE OF STEE OF STEE OF SHARP STEE OF STEE OF SHARP STEE OF	72LES: 7ER: 510 IN		HES		ZF Z V V	XING XING ANOGE	PRIAM	STACK LENGTH STACK DIAMETI FRATIC: 5 PRESSURE: 5	XING STACK LENGTH: 17.81 INCHES VIXING STACK LIMBTER: 7.122 INCHES MIXING STACK L/3: 2.50 STANDCFF RATIC: .50.00 INCHES HG
184.6 83.0 1271.0 647.0 67.0 184.2 83.0 1271.0 647.0 67.0 184.4 83.0 1272.0 649.0 67.0 184.2 83.0 1272.0 649.0 67.0 184.2 83.0 1272.0 649.0 68.0 183.6 83.0 1272.0 645.0 68.0 183.6 83.0 1272.0 645.0 68.0 183.1 83.0 1272.0 647.0 66.0 183.2 83.0 1272.0 647.0 66.0 183.1 83.0 1272.0 647.0 66.0 183.1 83.0 1272.0 647.0 66.0 183.1 83.0 1278.0 647.0 66.0 183.1 83.0 1278.0 650.0 67.0 1.161 0.338 0.291 0.169 0.476 1.170 0.660 0.564 0.038 0.476 1.171 1.069 0.913 0.018 0.477 1.171 1.069 0.913 0.018 0.477 1.171 1.104 0.543 0.0013 0.477 1.171 1.105 0.896 0.003 0.477 1.171 1.106 0.543 0.0013 0.477 1.171 1.106 0.543 0.0013 0.477 1.171 1.106 0.543 0.0013 0.477 1.171 1.106 0.543 0.0013 0.477 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.543 0.0013 0.477 1.171 1.106 0.543 0.0013 0.477 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.477 1.171 1.106 0.544 0.0000 0.477 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.544 0.0000 0.475 1.171 1.106 0.0000 0.0000 0.475 1.171 1.106 0.0000 0.0000 1.111 1.106 0.0000 0.0000 0.475 1.111 1.106	67.0 68.0 68.0 68.0 68.0 68.0 68.0 67.0 67.0 67.0 67.0 67.0 6.0476 6.0476 6.0477 7.4 6.0477 6.0477	.5C 184.6 83.0 1271.0 647.0 67.0 .5O 134.2 83.0 1271.0 647.0 67.0 .5O 134.4 83.0 1272.0 647.0 67.0 .5O 184.2 83.0 1272.0 648.0 68.0 .5O 184.2 83.0 1272.0 648.0 68.0 .5O 184.2 83.0 1272.0 645.0 68.0 .5O 183.6 83.0 1272.0 645.0 68.0 .5O 183.2 83.0 1272.0 645.0 68.0 .5O 183.2 83.0 1272.0 647.0 66.0 .5O 183.2 83.0 1272.0 647.0 66.0 .5O 183.1 83.0 1272.0 647.0 66.0 .5O 182.1 83.0 1272.0 647.0 66.0 .5O 183.0 0.271.0 640.0 0.169 0.476 .0B 1.161 0.33 0.291 0.128 0.476 .0B 1.170 0.660 0.564 0.038 0.476 .0B 1.171 1.049 0.896 0.0031 0.477 .0B 1.171 1.049 0.896 0.003 .0 1477 .0B 1.171 1.069 0.913 0.018 .0 10.000 0.475 .0B 1.111 1.049 0.543 0.0018 .0 1.050 0.75 1.00 1.20 .0 1.250 .0 1.250 0.75 1.00 1.20 .0 225.0	.56 184.6 83.0 1271.0 647.0 67.0 .50 134.2 83.0 1271.0 647.0 67.0 .50 134.4 83.0 1272.0 649.0 67.0 .50 184.2 83.0 1272.0 648.0 68.0 .50 184.2 83.0 1272.0 648.0 68.0 .50 183.5 83.0 1272.0 645.0 68.0 .50 183.5 83.0 1272.0 645.0 68.0 .50 183.2 83.0 1272.0 645.0 68.0 .50 183.2 83.0 1272.0 647.0 66.0 .50 183.2 83.0 1272.0 647.0 66.0 .50 183.2 83.0 1272.0 647.0 66.0 .50 183.1 0.0 0.0 0.0 0.169 0.476 .60 1.161 0.38 0.291 0.128 0.476 .60 1.110 0.060 0.564 0.089 0.476 .60 1.117 0.069 0.768 0.013 0.477 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 1.171 1.049 0.896 0.013 .60 0.75 1.00 1.20 .60 0.75 1.00 1.20 .60 0.75 1.00 1.20 .60 0.75 1.00 1.20 .60 0.75 1.00 1.20 .60 0.75 1.00 1.20 .60 0.75 1.00 1.20 .60 0.75 1.00 1.20 .60 0.75 1.00 1.20 .60 0.75 1.00 1.20 .60 0.75 1.00 1.20 .60 0.75 1.00 1.00	7.5C 184.6 83.0 1271.0 647.0 67.0 7.5G 184.2 83.0 1271.0 647.0 67.0 7.5G 184.2 83.0 1272.0 645.0 67.0 7.6G 184.2 83.0 1272.0 645.0 67.0 7.6G 184.2 83.0 1272.0 645.0 68.0 7.6G 184.2 83.0 1272.0 645.0 68.0 7.6G 183.6 83.0 1272.0 647.0 66.0 7.6G 183.6 83.0 1272.0 647.0 66.0 7.6G 183.6 83.0 1272.0 647.0 66.0 7.6G 183.1 83.0 1272.0 647.0 66.0 7.6G 183.1 83.0 1272.0 647.0 66.0 7.6G 182.1 83.0 1278.0 647.0 66.0 7.6G 1.161 0.0 0.0 0.0 0.169 0.476 0.008 1.161 0.544 0.468 0.104 0.475 0.008 1.170 0.660 0.564 0.038 0.477 0.008 1.171 1.049 0.896 0.013 0.477 0.008 1.171 1.049 0.896 0.013 0.477 0.008 1.171 1.049 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647.0 66.0 7.6G 183.6 83.0 1272.0 647.0 66.0 7.6G 183.1 83.0 1272.0 647.0 66.0 7.6G 182.1 83.0 1272.0 647.0 66.0 7.0G 1.161 0.0 0.0 0.0 0.169 0.475 0.008 1.161 0.246 0.291 0.128 0.475 0.008 1.170 0.660 0.564 0.038 0.477 0.008 1.171 1.049 0.896 0.013 0.477 0.008 1.171 1.049 0.896 0.013 0.477 0.008 1.171 1.049 0.996 0.013 0.477 0.008 1.171 1.049 0.243 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.049 0.243 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.008 1.171 1.069 0.913 0.013 0.477 0.009 1.171 1.069 0.913 0.013 0.477 0.009 1.171 1.069 0.913 0.013 0.477 0.009 0.75 1.00 1.20 1.20 1.40 0.75 1.00 1.20 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.20 1.40 0.75 1.00 1.20 1.20 1.40 0.75 1.00 1.20 1.20 1.40 0.75 1.00 1.20 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.00 1.20 1.40 0.75 1.40 0.	7.5C 184.6 83.0 1271.0 647.0 67.0 7.5G 184.2 83.0 1271.0 647.0 67.0 7.5G 184.2 83.0 1272.0 649.0 67.0 7.6G 184.2 83.0 1272.0 648.0 68.0 7.6G 184.2 83.0 1272.0 645.0 68.0 7.6G 183.3 1272.0 647.0 66.0 7.6G 183.3 1272.0 647.0 66.0 7.6G 183.3 1272.0 647.0 66.0 7.6G 11.61 0.0 0.0 0.169 0.476 0.008 1.161 0.338 0.291 0.128 0.476 0.008 1.170 0.660 0.564 0.088 0.476 0.008 1.171 1.069 0.896 0.013 0.477 0.008 1.171 1.069 0.896 0.013 0.477 0.009 1.165 ***** ***** 0.000 0.475 0.008 1.171 1.069 0.913 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1.009 0.896 0.013 0.477	5.10	7.50	184.2	93 •0	1271.0	0.749	0.10	6.30		2.50	2.50 6.283
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1.161 0.338 0.291 0.128 0.476 0.270 1.161 0.544 0.468 0.104 0.475 0.220 1.170 0.660 0.564 0.038 0.476 0.185 1.171 1.049 0.896 0.031 0.477 0.064 1.171 1.069 0.913 0.018 0.477 0.038 1.171 1.104 0.543 0.013 0.477 0.038 1.171 1.104 0.543 0.013 0.477 0.027 1.165 ***** ***** 0.000 0.475 0.000	6 0.476 0.270 4 0.475 0.220 8 0.476 0.185 8 0.477 0.064 1 0.477 0.038 3 0.477 0.027 0 0.475 0.000	C3 1.161 0.338 0.291 0.128 0.476 0.270 U3 1.161 0.544 0.468 0.104 0.475 0.220 U8 1.170 0.660 0.564 0.088 0.476 0.185 U8 1.171 1.069 0.768 0.031 0.477 0.064 U8 1.171 1.069 0.913 0.018 0.477 0.064 U8 1.171 1.104 0.543 0.013 0.477 0.027 U8 1.171 1.106 0.543 0.013 0.477 0.027 U8 1.171 1.104 0.543 0.013 0.477 0.027 U8 1.165 ***** ***** 0.000 0.475 0.000 PERATURES (DEG F), DPEN TO ATMOSPHERE U.50 0.75 0.75 1.00 1.20 1.50 2.50 2.50 2.50	C3 1.161 0.338 0.291 0.128 0.476 0.270 U3 1.161 0.544 0.468 0.104 0.475 0.220 U8 1.170 0.660 0.564 0.088 0.476 0.185 U8 1.171 1.069 0.768 0.031 0.477 0.064 U8 1.171 1.069 0.913 0.018 0.477 0.064 U8 1.171 1.104 0.543 0.018 0.477 0.038 U8 1.171 1.104 0.543 0.018 0.477 0.027 U8 1.171 1.104 0.543 0.013 0.477 0.027 U8 1.116 ***** ***** 0.000 0.475 0.000 PERATURES (DES F), DPEN TO ATMOSPHERE U 0.50 0.75 1.00 1.20 1.40 1.50 E6.0 141.0 156.C 143.0 225.0 2 ******* 123.0 163.0 188.0 216.0 2	0.003	0.003 1.161 0.338 0.291 0.128 0.476 0.270 0.004 1.161 0.544 0.468 0.104 0.475 0.220 0.038 1.170 0.660 0.564 0.089 0.476 0.185 0.008 1.171 1.049 0.366 0.031 0.477 0.064 0.008 1.171 1.069 0.913 0.013 0.477 0.036 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.1165 ***** ***** 0.000 0.475 0.000 X/D 0.50 0.75 1.00 1.20 1.40 1.50 X/D 0.50 0.75 1.40 1.50 1.40 1.50 A1 0.50 0.15	0.003 1.161 0.338 0.291 0.128 0.476 0.270 0.008 1.161 0.544 0.468 0.104 0.475 0.220 0.008 1.170 0.660 0.564 0.089 0.476 0.185 0.100 0.008 1.170 0.899 0.768 0.048 0.476 0.185 0.100 0.008 1.171 1.049 0.896 0.018 0.477 0.084 0.008 1.171 1.104 0.543 0.013 0.477 0.038 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 0.475 0.000 0.009 1.165 ***** 1.20 1.40 1.50 0.000 0.475 0.000 0.4	0.003	0.003 1.161 0.338 0.291 0.128 0.476 0.270 0.008 1.161 0.544 0.468 0.104 0.475 0.220 0.208 1.170 0.660 0.564 0.388 0.476 0.185 0.220 0.008 1.170 0.699 0.768 0.048 0.476 0.185 0.008 1.171 1.049 0.895 0.013 0.477 0.064 0.008 1.171 1.049 0.893 0.013 0.477 0.027 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 0.475 0.000 0.009 1.165 ***** ***** 0.000 0.475 0.000 0.009 1.165 ***** 0.000 0.475 0.000 0.475 0.000 0.009 1.165 0.000 0.475 0.000	0.003 1.161 0.338 0.291 0.128 0.476 0.270 0.008 1.161 0.544 0.468 0.104 0.475 0.220 0.208 1.170 0.660 0.564 0.388 0.476 0.185 0.220 0.008 1.170 0.699 0.768 0.048 0.476 0.185 0.008 1.171 1.069 0.913 0.013 0.477 0.064 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 4.*** 4.*** 0.000 0.475 0.000 0.475 0.000 0.009 1.165 1.165 4.*** 1.23.0 1.60 1.20 1.40 1.50 0.000 0.475 0.0		6.008	1.161	0.0	0.0	0.169	0.476	0.354	0.0		295.2
1.161 0.544 0.468 0.104 0.475 0.220 1.170 0.660 0.564 0.088 0.476 0.185 1.171 0.899 0.768 0.048 0.476 0.100 1.171 1.069 0.913 0.018 0.477 0.064 1.171 1.104 0.543 0.013 0.477 0.038 1.165 ***** ***** 0.000 0.475 0.000	4 0.475 0.220 8 0.476 0.185 8 0.477 0.064 1 0.477 0.038 3 0.477 0.027 0 0.475 0.000	08 1.161 0.544 0.468 0.104 0.475 0.220 08 1.170 0.660 0.564 0.088 0.476 0.185 08 1.171 0.899 0.768 0.048 0.476 0.186 08 1.171 1.069 0.896 0.031 0.477 0.064 08 1.171 1.069 0.913 0.018 0.477 0.038 08 1.171 1.104 0.543 0.013 0.477 0.037 09 1.165 ***** ***** 0.000 0.475 0.000 PERATURES (DEG F), DPEN TO ATMOSPHERE 0.550 0.75 1.00 1.20 1.40 1.50 2.500 2.500 2.500	08 1.161 0.544 0.468 0.104 0.475 0.220 08 1.170 0.660 0.564 0.088 0.476 0.185 08 1.171 0.899 0.768 0.048 0.476 0.186 08 1.171 1.049 0.896 0.031 0.477 0.064 08 1.171 1.049 0.896 0.013 0.477 0.064 08 1.171 1.104 0.543 0.018 0.477 0.027 09 1.1165 ***** ***** 0.000 0.475 0.000 PERATURES (DEG F), DPEN TG ATMOS PHERE 0.50 0.75 1.00 1.20 1.40 1.50 66.0 141.0 156.C 143.0 225.0 2 ******* 123.0 163.0 188.0 216.0 2	0.008	0.008	0.008	0.008	0.008	0.008		5.008	191.1	0.338	0.291	0.128	0.476	0.270	0.21	0	0 254.7
1.170 0.660 0.564 0.388 0.476 0.185 1.170 0.899 0.768 0.048 C.478 0.100 1.171 1.069 0.896 0.031 0.477 0.064 1.171 1.069 0.913 0.018 0.477 0.038 1.171 1.104 0.543 0.013 0.477 0.027 1.165 ***** ***** 0.000 0.475 0.000	8 0.476 0.185 8 C.478 0.100 1 0.477 0.064 8 0.477 0.038 3 0.477 0.027 0 0.475 0.000	08 1.170 0.660 0.564 0.388 0.476 0.185 08 1.170 0.899 0.768 0.048 C.478 0.100 08 1.171 1.049 0.896 0.031 0.477 0.064 08 1.171 1.069 0.913 0.018 0.477 0.038 08 1.171 1.104 0.543 0.013 0.477 0.038 08 1.171 1.104 0.543 0.013 0.477 0.027 PERATURES (DEG F), DPEN TO ATMOSPHERE 1 0.50 0.75 1.00 1.20 1.40 1.50 25.0 25.0	08 1.170 0.660 0.564 0.388 0.476 0.185 08 1.170 0.899 0.768 0.048 C.478 0.100 08 1.171 1.049 0.896 0.031 0.477 0.064 08 1.171 1.069 0.913 0.018 0.477 0.038 08 1.171 1.104 0.543 0.013 0.477 0.038 08 1.171 1.104 0.543 0.013 0.477 0.027 09 1.165 ***** ***** 0.000 0.475 0.000 PERATURES (DEG F), DPEN TG ATMOSPHERE 0.50 0.75 1.00 1.20 1.40 1.50 66.0 141.0 156.C 143.0 225.0 2 ******* 123.0 163.0 188.0 216.0 2	0.308 1.170 0.660 0.564 0.388 0.476 0.185 0.008 1.173 0.899 0.768 0.048 0.477 0.100 0.008 1.171 1.049 0.896 0.013 0.477 0.064 0.008 1.171 1.104 0.543 0.013 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHER E X/O 0.50 0.75 1.00 1.20 1.40 1.50 A1 66.0 141.0 156.C 143.0 225.0 B1 ****** 123.0 163.0 188.0 216.0 A1 71.4 75.4 93.0	0.008 1.170 0.660 0.564 0.088 0.476 0.185 0.008 1.170 0.899 0.768 0.048 0.477 0.100 0.008 1.171 1.049 0.896 0.013 0.477 0.064 0.008 1.171 1.104 0.543 0.013 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** **** 0.000 0.475 0.000 0.00 0.16	0.008 1.170 0.660 0.564 0.088 0.476 0.185 0.008 1.170 0.899 0.768 0.048 0.477 0.100 0.008 1.171 1.049 0.896 0.013 0.477 0.064 0.008 1.171 1.104 0.543 0.013 0.477 0.038 0.009 1.165 ***** **** 0.000 0.477 0.027 0.009 1.170 1.105 0.999 0.18 0.013 0.477 0.027 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** 1.00 1.20 1.40 1.50 0.50 0.75 1.00 1.20 1.40 1.50 0.50 0.75 1.00 1.20 1.40 1.50 0.50 0.75 1.00 1.50 0.55.0 0.50 0.75 1.00 1.50 0.55.0 0.50 0.75 1.00 1.50 0.55.0 0.50 0.75 1.00 1.50 0.55.0 0.50 0.75 1.00 1.50 0.50 0.50 0.75 1.00 1.50 0.50 0.50 0.50 0.75 1.00 0.50 0.75 0.000	0.308 1.170 0.660 0.564 0.388 0.476 0.185 0.008 1.170 0.899 0.768 0.048 C.478 0.100 C.CCB 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.069 0.913 0.018 0.477 0.038 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ****** 123.0 163.0 188.0 216.0 A) 71.4 75.4 188.0 216.0 B) ******* 17.3 75.6	0.308 1.170 0.660 0.564 0.388 0.476 0.185 0.008 1.170 0.899 0.768 0.048 C.478 0.100 C.CCB 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.069 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.018 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DES F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 71.4 75.4 188.0 216.0 23.0 A) 71.4 75.4 188.0 216.0 43.0 A) 71.4 75.4 A) A) A1.4 75.4 A3.6 A3.6 A3.6 A3.6 A3.0 A3.0 A) A3.6 A3.6 A3.6 A3.6 A3.6 A3.6 A3.6 A3.6	0.308 1.170 0.660 0.564 0.388 0.476 0.185 0.008 1.170 0.899 0.768 0.048 C.478 0.100 C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.069 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.037 0.009 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A1 46.0 141.0 156.C 143.0 225.0 A1 71.4 75.4 75.4 B1 71.3 75.6 A3 A4		0.008	1.161	0.544	0.468	0.104	0.475	0.220	0.33	~	7 294.9
1.173 0.899 0.768 0.048 C.478 0.100 1.171 1.049 0.896 0.031 0.477 0.064 1.171 1.069 0.913 0.018 0.477 0.038 1.171 1.104 0.543 0.013 0.477 0.027 1.165 ***** ***** 0.000 0.475 0.000	8	08 1.170 0.899 0.768 0.048 C.478 0.100 CG8 1.171 1.049 0.896 0.031 0.477 0.064 OB 1.171 1.069 0.913 0.018 0.477 0.038 CG8 1.171 1.104 0.543 0.013 0.477 0.038 CG9 1.171 1.104 0.543 0.013 0.477 0.027 CG9 1.165 ***** ***** 0.000 0.475 0.000 PERATURES (DEG F), DPEN TG ATMOSPHERE CG60 0.75 1.00 1.20 1.40 1.50 CG60 141.0 156.C 143.0 225.0 2	08 1.170 0.899 0.768 0.048 C.478 0.100 CG 1.171 1.049 0.896 0.031 0.477 0.064 OB 1.171 1.049 0.913 0.018 0.477 0.038 OB 1.171 1.104 0.543 0.013 0.477 0.038 OB 1.171 1.104 0.543 0.013 0.477 0.038 OB 1.165 ***** ***** 0.000 0.475 0.000 PERATURES (DEG F), DPEN TG ATMOSPHER E 0.50 0.75 1.00 1.20 1.40 1.50 66.0 141.0 156.C 143.0 225.0 2 ******* 123.0 163.0 188.0 216.0 2	0.008 1.170 0.899 0.768 0.048 C.478 0.100 C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.049 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.038 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 X/O 0.50 0.75 1.00 1.20 1.40 1.50 A1 66.0 141.0 156.C 143.0 225.0 B1 ****** 123.0 163.0 188.0 216.0 A1 71.4 75.4 93.0	0.008 1.170 0.899 0.768 0.048 C.478 0.100 C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.049 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.038 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 1.00 1.20 1.40 1.50 X/D 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 2 B) ****** 123.0 163.0 188.0 216.0 A) 71.4 75.4 75.4 B) 71.3 75.4	0.008 1.170 0.899 0.768 0.048 C.478 0.100 C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.069 0.913 0.013 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.038 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 EMPTRATURES (DES F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ****** 123.0 163.0 188.0 216.0 23.4 A) 71.4 75.4 89.0 A) 71.4 75.6	0.008 1.170 0.899 0.768 0.048 C.478 0.100 C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.049 0.943 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DES F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ****** 123.0 163.0 188.0 216.0 A) 71.4 75.4 B) 71.3 75.6 B)	0.008 1.170 0.899 0.768 0.048 C.478 0.100 C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.049 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.038 0.009 1.165 ***** ***** 0.000 0.475 0.007 TEMPERATURES (DEG F), DPEN TG ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A1 46.0 141.0 156.C 143.0 225.0 A2 71.4 75.4 75.4 A3 71.4 75.4 A4	0.008 1.170 0.899 0.768 0.048 C.478 0.100 C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.049 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 71.4 75.4 123.0 163.0 188.0 216.0 A) 71.4 75.4 75.4 B) A)		900.0	1.170	099-0	0.564	0.388	0.476	0.185	0.40	~	7 296.7
1.171 1.049 0.896 0.031 0.477 0.064 1.171 1.069 0.913 0.018 0.477 0.038 1.171 1.104 0.543 0.013 0.477 0.027 1.165 **** **** 0.000 0.475 0.000	1 0.477 0.064 8 0.477 0.038 3 0.477 0.027 0 0.475 0.000	(GB 1.171 1.049 0.896 0.031 0.477 0.064 (GB 1.171 1.069 0.913 0.018 0.477 0.038 (GB 1.171 1.104 0.543 0.013 0.477 0.038 (GB 1.171 1.104 0.543 0.013 0.477 0.027 (GB 1.165 ***** **** 0.000 0.477 0.027 (GB 1.165 ***** 1.165 0.000 0.475 0.000 (GB 1.165 1.165 1.160 1.20 1.40 1.50 (GB 0.50 0.75 1.00 1.20 1.40 1.50 (GB 0.75 1.00 1.20 1.40 1.50 (GB 0.75 1.00 1.20 1.40 1.50 (GB 0.75 1.40 1.40 (GB 0.75 1.40 1.40 (GB 0.75 1.40 1.40 (GB 0.75 1.40 (GB	(08 1.171 1.049 0.896 0.031 0.477 0.064 (08 1.171 1.069 0.913 0.018 0.477 0.038 (08 1.171 1.104 0.543 0.013 0.477 0.038 (08 1.171 1.104 0.543 0.013 0.477 0.027 (08 1.172 1.105 ***** 0.000 0.475 0.000 (0.475 0.000 0.475 0.0	C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.069 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.037 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 X/O 0.50 0.75 1.00 1.20 1.40 1.50 A1 66.0 141.0 156.C 143.0 225.0 B1 ****** 123.0 163.0 188.0 216.0 A1 71.4 75.4 93.0	C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.00B 1.171 1.069 0.913 0.018 0.477 0.038 0.00B 1.171 1.104 0.543 0.013 0.477 0.038 0.00B 1.171 1.104 0.543 0.013 0.477 0.027 0.00B 1.175 ***** ***** 0.000 0.475 0.000 0.00B 1.175 1.100 1.20 1.40 1.50 X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ****** 123.0 163.0 188.0 216.0 A) 71.4 75.4 893.0	C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.00B 1.171 1.069 0.913 0.018 0.477 0.038 0.00B 1.171 1.104 0.543 0.013 0.477 0.037 0.00B 1.171 1.104 0.543 0.013 0.477 0.027 0.00B 1.165 ***** ***** 0.000 0.475 0.000 0.50 0.75 1.00 1.20 1.40 1.50 0.50 0.75 1.00 1.20 1.40 1.50 0.50 0.75 1.00 1.20 1.40 0.55 0.75 0.75 1.00 1.50 0.55 0.75 0.75 1.00 1.50 0.55 0.75 0.75 1.00 1.50 0.55 0.75 0.75 0.000	C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.069 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.037 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.155 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DES F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A1 66.0 141.0 156.C 143.0 225.0 B1 ****** 123.0 163.0 188.0 216.0 A1 71.4 75.4 75.4 A1 71.3 75.6	C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.069 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.037 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ******* 123.0 163.0 188.0 216.0 A) 71.4 75.4 75.4 B) A)	C.CC8 1.171 1.049 0.896 0.031 0.477 0.064 0.008 1.171 1.069 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.037 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHER E X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 1/41.0 156.C 1/43.0 225.0 B) ******* 123.0 163.0 188.0 216.0 A) 71.4 75.4 B) A) A) A) A) A) B) A)		900°C	1.179	0.899	0.768	0.048	6.478	0.100	0.555		295.4
1.171 1.069 0.913 0.016 0.477 0.038 1.171 1.104 0.543 0.013 0.477 0.027 1.165 ***** ***** 0.000 0.475 0.000	8 0.477 0.038 3 0.477 0.027 0 0.475 0.000 1.40 1.50	OB 1.171 1.069 0.913 0.016 0.477 0.036 OB 1.171 1.104 0.543 0.013 0.477 0.027 OB 1.165 ***** ***** 0.000 0.475 0.000 PERATURES (DEG F), DPEN TG ATMOSPHER E O.50 0.75 1.00 1.20 1.40 1.50 66.0 141.0 156.C 143.0 225.0 2	OB 1.171 1.069 0.913 0.016 0.477 0.036 OB 1.171 1.104 0.543 0.013 0.477 0.027 OB 1.165 ***** ***** 0.000 0.475 0.000 PERATURES (DEG F), DPEN TG ATMOSPHERE O.50 0.75 1.00 1.20 1.40 1.50 66.0 141.0 156.C 143.0 225.0 2 ******* 123.0 163.0 188.0 216.0 2	0.008 1.171 1.069 0.913 0.016 0.477 0.036 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.171 1.105 0.543 0.013 0.477 0.027 0.009 1.155 0.000 0.475 0.000 0.009 1.155 0.000 0.475 0.000 0.000 0.000 0.475 0.000	0.008 1.171 1.069 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.171 1.105 0.543 0.013 0.477 0.027 0.000 1.171 1.105 ***** ***** 0.000 0.475 0.000	0.008 1.171 1.069 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.155 ***** ***** 0.000 0.475 0.027 0.009 1.165 ***** 0.000 0.475 0.000 0.009 1.165 0.000 0.475 0.000 0.009 0.000 0.475 0.000 0.000 0.000 0.475 0.000 0.000 0.475 0.000 0.000 0.475 0.000 0.000 0.475 0.000 0.000 0.475 0.000 0.000 0.475 0.000 0.000 0.000 0.000 0.000	0.008 1.171 1.069 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.171 1.105 0.543 0.013 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 0.009 1.165 0.000 0.475 0.000 0.000 0.475 0.000 0.000 0.475 0.000 0.000 0.475 0.000 0.000	0.008 1.171 1.069 0.913 0.018 0.477 0.038 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.171 1.105 0.543 0.013 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 0.009 1.165 0.000 0.475 0.000 0.009 0.475 0.000 0.009 0.475 0.000	0.008 1.171 1.069 0.913 0.016 0.477 0.036 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.156 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ******* 123.0 163.0 188.0 216.0 A) 71.4 75.4 93.0 A)		833.3	1.171	1.049	0.896	0.031	. 114.0	990.0	0.647	_	295.5
1.165 ***** ***** 0.000 0.475 0.027	3 0.477 0.027 0 0.475 0.000 1.40 1.50	108 1.171 1.104 0.543 0.013 0.477 0.027 0.08 1.165 ***** ***** 0.000 0.475 0.000 0.675 0.000 0.675 0.000 0.675 0.000 0.675 0.000 0.60 0.75 1.00 1.20 1.40 1.50 66.0 141.0 156.0 143.0 225.0 225.0 2	08 1.171 1.104 0.543 0.013 0.477 0.027 0.08 1.165 ***** ***** 0.000 0.475 0.000 0.475 0.000 0.68 1.165 ***** 1.00 1.20 1.40 1.50 6.0 0.75 1.00 1.20 1.40 1.50 6.0 0.75 1.00 1.20 1.40 1.50 6.0 0.75 1.00 1.20 1.40 1.50 6.0 0.75 1.00 1.20 1.40 1.50 6.0 0.75 1.00 1.50 6.0 0.75 1.00 1.50 6.0 0.75 1.00 1.50 6.0 0.75 1.00 1.50 6.0 0.75 1.00 1.50 6.0 0.75 1.00 1.50 6.0 0.75 1.00 1.50 6.0 0.75 1.00 1.50 6.0 0.75 1.00 1.50 6.0 0.75 1.00 1.50 6.0 0.000 6	0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.165 ***** ***** 0.000 0.475 0.000 0.000 1.165 ***** 0.000 0.475 0.000	0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.003 1.165 ***** ***** 0.000 0.475 0.000 0.003 1.165 ***** 1.165 ***** 0.000 0.475 0.000 0.000 0.475 0.000 0.000 0.475 0.000 0.000 0.475 0.000 0.000 0.475 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TG ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A1 66.0 141.0 156.C 143.0 225.0 B1 ****** 123.0 163.0 188.0 216.0 A1 71.4 75.4 93.0 A1 71.4 75.6 93.0 A1 71.3 75.6	0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.009 1.165 ***** **** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/D 0.50 0.75 1.00 1.20 1.40 1.50 A1 66.0 141.0 156.C 143.0 225.0 B1 ****** 123.0 163.0 188.0 216.0 A1 71.4 75.4 93.0 A1 71.3 75.6 92.4 B3	0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.165 ***** ***** 0.000 0.475 0.000 0.008 1.165 ***** 0.000 0.475 0.000 0.008 1.165 ***** 0.000 0.475 0.000 0.000 0.000 0.475 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	0.008 1.171 1.104 0.543 0.013 0.477 0.027 0.008 1.165 ***** **** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/D 0.50 0.75 1.00 1.20 1.40 1.50 A1 66.0 141.0 156.C 143.0 225.0 B1 ****** 123.0 163.0 188.0 216.0 A1 71.4 75.4 A1 71.3 75.6 A3 A4 A4 A5		0.00B	1.171	1 .069	0.913	0.018	0.477	0.038	C. 65 9		255.6
1.165 ***** **** 0.000 0.475 0.000	0.475 0.000	1.165	1.165	0.008 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ****** 123.0 163.0 188.0 216.0 A) 71.4 75.4 93.0	0.008 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A1 66.0 141.0 156.C 143.0 225.0 B1 ****** 123.0 163.0 188.0 216.0 2 A1 71.4 75.4 93.0 P3.6	0.008 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A1 66.0 141.0 156.C 143.0 225.0 B1 ****** 123.0 163.0 188.0 216.0 2 A1 71.4 75.4 93.0 A1 71.3 75.6 92.4	D.008 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ****** 123.0 163.0 188.0 216.0 A) 71.4 75.4 B) 71.3 75.6	D.008 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/D 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ****** 123.0 163.0 188.0 216.0 A) 71.4 75.4 A) A) 71.4 75.6 A) A) A)	D.008 1.165 ***** ***** 0.000 0.475 0.000 TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/D 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ****** 123.0 163.0 188.0 216.0 A) 71.4 75.4 93.0 A) A) A) A) A) A) A) A) A)		0.008	1.171	1.104	0.543	0.013	0.477	0.027	0.680		295 •6
	1.40 1.50	PERATURES (DEG F), DPEN TO ATMOSPHERE 1 0.50 0.75 1.00 1.20 1.40 1.50 66.0 141.0 156.C 143.0 225.0	PERATURES (DEG F), DPEN TO ATMOSPHERE 0.50 0.75 1.00 1.20 1.40 1.50 66.0 141.0 156.C 143.0 225.0 ******* 123.0 163.0 188.0 216.0	TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ******* 123.0 163.0 188.0 216.0 A) 71.4 75.4 93.0	TEMPERATURES (DEG F), OPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ******* 123.0 163.0 188.0 216.0 A) 71.4 75.4 93.0 P) 71.3 75.6	TEMPERATURES (DEG F), OPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ******* 123.0 163.0 188.0 216.0 A) 71.4 75.4 93.0 B) 71.3 75.6	TEMPERATURES (DEG F), DPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ******* 123.0 163.0 188.0 216.0 A) 71.4 75.4 93.0 A) A) A) A) A) A)	TEMPERATURES (DEG F), OPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ******* 123.0 163.0 188.0 216.0 A) 71.4 75.4 93.0 A) A) 71.3 75.6 A) A)	TEMPERATURES (DEG F), OPEN TO ATMOSPHERE X/O 0.50 0.75 1.00 1.20 1.40 1.50 A) 66.0 141.0 156.C 143.0 225.0 B) ******* 123.0 163.0 188.0 216.0 A) 71.4 75.4 93.0 A) A) A) A) A) A) A)		0.008	1.165	**	* * * * *	00000	0.475	00000	* * *		254.6
		66.0 141.0 156.C 143.0 225.0	66.0 141.0 156.C 143.0 225.0 ****** 123.0 163.0 188.0 216.0	A1 66.0 141.0 156.0 143.0 225.0 81 ******* 123.0 163.0 188.0 216.0 A1 71.4 75.4 93.0	A1 66.0 141.0 156.0 143.0 225.0 81 ************************************	4) 66.0 141.0 156.0 143.0 225.0 8) ******* 123.0 163.0 188.0 216.0 4) 71.4 75.4 93.0 6) 71.3 75.6 92.4	4) 66.0 141.0 156.0 143.0 225.0 8) ****** 123.0 163.0 188.0 216.0 A) 71.4 75.4 93.0 A) 71.3 75.6 92.4 A)	4) 66.0 141.0 156.0 143.0 225.0 8) ****** 123.0 163.0 188.0 216.0 4) 71.4 75.4 93.0 4) 71.3 75.6 93.0 6)	4) 66.0 141.0 156.0 143.0 225.0 8) ******* 123.0 163.0 188.0 216.0 4) 71.4 75.4 93.0 4) 4) 71.3 75.6 4) 4) 8)		0/x	0.50	0.75	1.00	1.20	1.40	1,50	1.60		2.00

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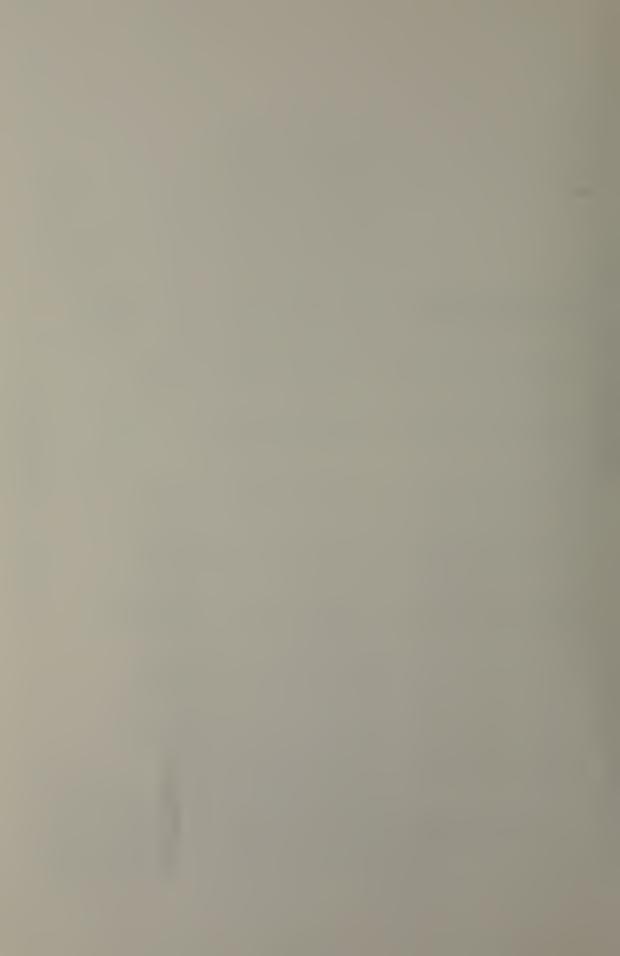
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Table IV. (Continued)

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DATA TAKEN BY J A HILL

DATE: 17 ALG 79

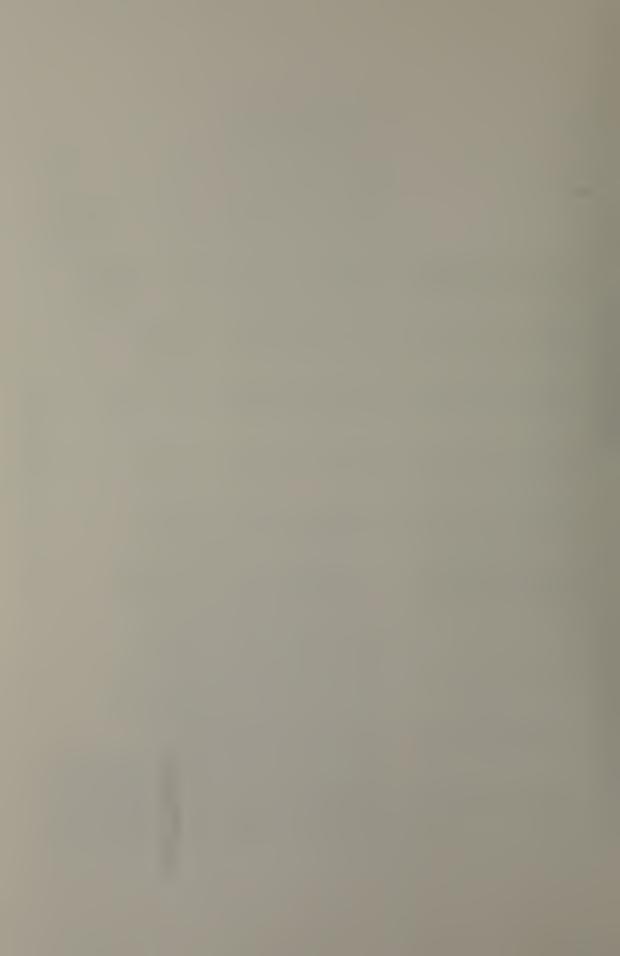
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												UMACH	.0648	.0645	.0644	.0642	.0643	.0642	.0640	.0541	.0642										
												UU FT/S	105.4	108.7	108.4	108.1	108.4	108.2	107.5	107.8	108.0		2.50							114.4	130.9
NCHES INCHES	ES HG											LIM FT/S	124.6	139.6	149.0	154.3	165.8	171.7	174.0	177.1	***		2.25					128.8	128.4	133.0	112.0
17-81 I	*06 1NCH	SEC AREA	0.0	6.283	11.192	14. 726	27.293	35.859	5 2. 425	64.992	* * * *	UP FT/S	312.2	305.8	309.4	368.8	309.4	308.6	306.6	307.6	307.9		2.00			154.9	156.1	105.1	100.9		
MIXING STACK LENGTH: 17-81 INCHES MIXING STACK DIAMETER: 7.122 INCHES STAND LF 6: 50-50	SURE: 30	PA-PS IN H20	3.16	2, 38	1.91	1.64	68.0	0.55	6.36	0.26	00.00	55"** 1#M	0.0	C. 204	0.326	965.0	0.542	0.622	6.664	669.0	***		1.60	235.0	245.0						
ING STACK ING STACK ING STACK NDCFF RACK	IENT PRES	PU-0A IN H20	7.00	7.10	8.10	8.80	00.6	04.6	9.50	09.6	9.70	b*/1*	0.332	0.254	0.203	0.175	960.0	0.059	0.039	0.028	000.0		1.50			108.3	107.4				
EXEN.	m Σ ∢	TAM8 -	73.0	13.0	73.0	73.0	73.0	73.0	73.0	73.0	72.0	<u>*</u>	0*4*0	0.441	0.441	0.442	C- 440	0.441	0.444	C. 442	0.441		1.40	261.0	250.0						
		TUPT DEG F	750.0	149.0	147.0	146.0	750, 0	748.0	741.0	145.0	745.0	* d	0.146	0.112	0.000	0.077	0.042	0.026	0.017	0.012	000-0	PHERE	1.20	154.0	236.0				•		
ES		TBURN DEG F	1281.0	1288.0	1286.0	1277.0	1286.0	1275.0	1274.0	1266.0	1215.0	*	0.0	0.293	0.467	.695.0	0.777	0.892	0.950	1. 001	* * *	I TC ATMOSPHERE	1.00	***	202.0	87.3	87.5				
4 INCHES		FH2 H7	1 02.0	1 03 .0	103.0	103.0	103.0	103.0	102.0	102.0	99.0	us LBM/S	0.0	0.328 .	0.523	0.638	0.871	1.000	1.064	1.121	****	F1, OPEN	0.75	* 0.561	132.0						
Y NOTZLES: 2.25 01AMETER: 2.25 17.510 INCHES		TPNH CEG F	186.6	186.1	186.0	186.3	186.0	186.0	186.0	136.0	179.6	L BY/S	1.124	1.119	1.126	1.120	1.120	1.120	1.120	1.120	1.122	TEMPERATURES (DEG	0.50	151.0	138.0	81.2	8C. 9				
TELE OIAM	31	OELPN IN P20	7. 10	7.00	1.00	7.00	7.00	7.00	7.00	7.00	7.00	L EY/S	0.010	0.010	0.010	0.010	0.010	C. 010	0.010	0.010	0.010	TEMPERAT	0/x	1 A)	18 N	₹ V 1	T 8.1	1 A J	1 93	1 A J	- E3
NIMBER CF PULLARY PALMARY NOZZLE UPTAKE CIRVETE :	WAR I.	PNH IN HG	4. 10	4.8C	06.4	95 .4	05*4	75°4	75°4	4.90	4.70	MPA LBV/S	1.114	1.109	011.1	1.116	1.110	1.110	1.110	1.110	1.112	XING STACK		HOLTE POSTE ION	(POST TION	THENDE (PUS IT	TISCA) ON C	5 1 (PDSIT	11 (PUS1T	3 2 (90 \$1 1	3 2 (PCSIT
2004	į,	α Z	-	7	m	4	ς.	٥	7	ъ	υ	<u>e</u>	-	2	m	4	S	Ð	7	30	5	MIX		24.7	IME	SHR	S+5.3 UO	RI NG	F11.6	RIMS	RING

Table IV. (Continued)

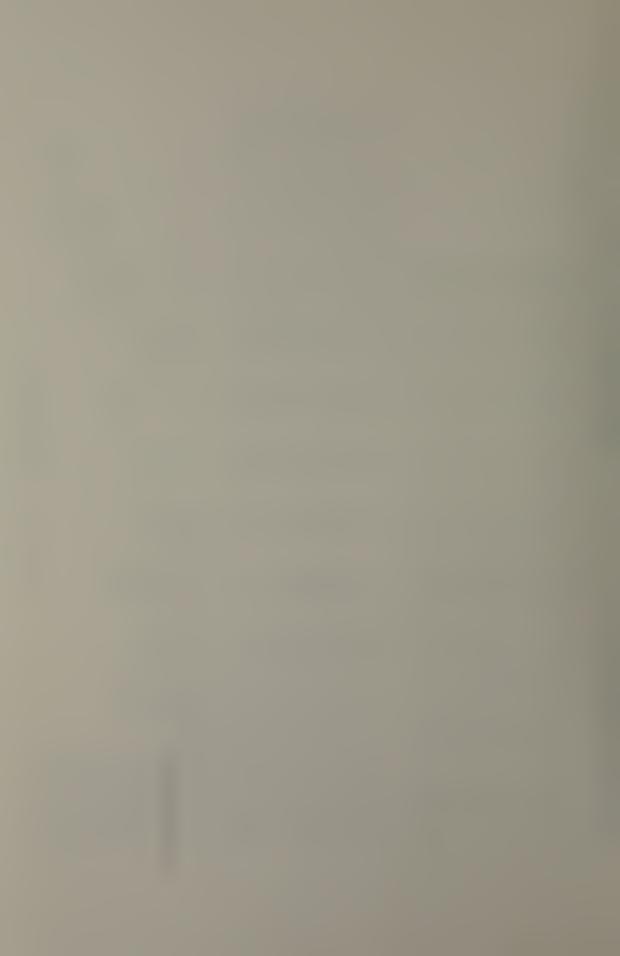


												GACH.	.0641	• 6890	.0638	.0638	.0637	.0638	.0637	•0639	.0439											
												UU FT/S	107.8	107.5	107.4	1 C7.4	107.2	167.9	1 67.6	107.7	107.6		2.50							104.8	119.5	
	NCHES INCHES ES HG											ET/S	122.6	137.8	147.1	152.3	163.1	170.2	173.2	175.6	:	•	2.25					116.0	115.8	121.8	102.2	
_	17.81 I 50 50 INCH	SEC AREA	0.0	6.283	11.192	14.726	27.293	35.859	52,425	64.992	* * * * * * * * * * * * * * * * * * * *	UP FT/S	307.0	305.9	305.6	305.5	305.1	307.7	207.1	307.1	307.0		2.00			140.2	141.3	94.2	6.06			
Y J A HILL	LENGTH: DIAMETER L/D: 2. IC: 50. SURE: 30	o 4-PS IN H20	3-12	2.32	1.87	1.59	. 98.0	0.53	0.35	0.25	00.00	75° ** L# M	0.0	0.204	0.326	966.0	C. 540	0.616	099.3	0.688	***		1.60	222.0	232.0							
DATA TAKEN BY	WIXING STACK LENGTH: 17-81 INCHES WIXING STACK DIAMFTER: 7.122 INCHES WIXING STACK L/D: 2.50 STANCFF RATIC: 50.03 INCHES HG AMBIENT PRESSURE: 30.03 INCHES HG	PU-PA IN H20	9.30	27.7	7 .00	7.20	7.90	00.6	09.6	09.6	9.80	p*/T#	0.338	0.253	0.204	0.173	0.094	0.057	0.C38	0.027	000-0		1.50			97.0	97.0					uned)
DA	ALENA	TAW8 OEGF	0.99	0.39	0.99	0.99	0.33	0.99	66.0	66.0	0.99	<u>*</u>	0.437	0.437	0.437	0.437	0.436	0.432	0.432	C. 436	0.435		1.40	245.0	236.0							(Continued)
		TUPT DEG F	144.0	743.0	744.0	144.0	145.0	757.0	756.0	146.0	748.0	å	0.148	0.110	0.089	910.0	0.041	0.025	0.016	3.012	000-0	SPHERE	1.20	140.0	222.0							IV,
	HES	TBURN DEG F	1288.0	1284.0	1296.0	1298.0	1295.0	1265.0	1260.0	1253.0	1271.0	* 35	0.0	0.294	0.410	0.570	111.0	0. 692	0.954	0.991	\$ *	RATURES 10EG F1, OPEN TO ATMOSPHERE	1.00	132.0	190.0	78.3	18.5					Table
	HES I NCHES	FH 2	95.0	0.96	0 -75	95.0	95.0	0.95	0.96	55.0	0.36	HS TEM/S	0.0	0.326	0.521	0.632	0.861	0.587	1.055	1.105	***	. F.) , OPE	0.75	174.0	124.0							
	17 N 17 ZL ES: 2.25 11 A 4 E F ER: 2.25 17 - 5.10 INCHES	TPNH CEG F	162.2	163.2	164.0	165.2	165.8	166.7	167.5	169.3	171.1	L 94/S	1.105	1.109	1.108	1.10 €	1.108	1.107	1.106	1.116	1.114	URES 10EC	0.50	66.0	***	73.2	73.4					
18 AUG 79	A HUNG	OELPY IN H27	€. 8C	08.9	08.9	6.80	08.9	6.70	6.70	6.80	6.80	L P4/S	600.0	0.010	0.010	600.0	600°0	010.0	0.00.0	600.0	C. C10	TEYPERAT	0/x	(d >	8	(4 7	T 8)	T A)	T e)	T A)	. E.	
OATE: 18 /	FRIMER CF PR FRIMERY MOZZ USTEKE CIANE PSED RATION	PNH UI	4.00	4.00	4.00	4.10	4.10	4. 60	4.60	4.80	4. 60	WPA LEW/S	1. 100	1.099	1.098	1. 655	1.098	1.057	1.057	901-1	1.105	XI'16 STACK		NOT IT SUNT SHE	NO1113C4)	SHROUD IFOSIT	TISCA) ONC	S 1 IFCSIT	G 1 (FOSIT	C 2 (POSIT	G 2 (FCS IT	
ð	26233	ž	-	7	m	4	2	9	-	on	5	ä	-	2	M	4	ß	0	-	70	O.	XIX		THE	14.5	SHR	SHPJUO	RING	RING	SING	714	



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1	JAIE: I/ ALG /9	22					0	AT A TAKEN	DATA TAKEN BY JA HILL	11			
0.66 F 10.0 PA 0.0 68.0 6.40 3.10 0.0 61.0 6.70 2.70 6.283 61.0 7.10 2.20 11.192 68.0 7.80 1.55 14.126 66.0 7.80 1.55 14.126 66.0 7.80 1.55 14.126 66.0 7.80 0.53 39.659 71.0 10.50 0.23 39.659 71.0 11.20 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.40 0.00 ******* 71.0 11.40 0.00 ******* 71.0 11.40 11.40 112.0 8 0.25 0.25 320.0 127.4 9 0.05 0.25 320.0 112.4 10.40 0.05 0.25 320.0 116.5 11.0 0.05 0.05 0.56 320.0 116.5 11.40	4 5 EN E	INARY N	10.22LES: E-ER: -5.50 IN	2.25 CHE \$ 1 NG	HES		IZINA	IXING STALINI STALINI STALINI STALINI STALINI STALINI STALINI STALINI STALINI PRIENT PRI	CK DIAMETH	R: 17-81 50 30-13 INC	I NC HES 2 INCHES HES HG		
68.0 6.40 3.10 0.0 47.0 6.7C 2.70 6.283 69.0 7.10 2.20 11.192 68.0 7.80 1.55 14.126 4E.0 8.30 0.88 27.293 71.0 10.50 0.53 39.859 71.0 11.20 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.40, 0.00 320.0 127.8 112.3 7 0.405 0.333 0.0 320.0 127.8 112.2 7 0.406 0.237 0.333 319.7 154.8 112.2 8 C.399 0.055 0.566 320.4 144.P 112.9 9 0.394 0.056 0.207 320.9 115.5 112.2 1 0.403 0.039 0.668 320.9 115.5 112.2 1 0.405 0.208 0.704 323.0 116.4 1 1.40 1.50 1.60 2.00. 2.00. 2.25 2.50 2 2 2 2 0.000 2 2 4 8.0 2 2 2 0.000 2 2 2 8 0.000 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		DEL PN	TPNH DEG F	FEZ	T BUS PN	TUPT OEG F	TAMB OEG F	PU-PA IN H20	PA-PS IN H20	S EC AREA			
61.0 6.7C 2.70 6.283 61.0 7.10 2.20 11.192 68.0 7.80 1.55 14.72¢ 68.0 7.80 1.55 14.72¢ 68.0 7.80 0.53 39.859 71.0 10.50 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.40, 0.00 ***** 7 0.40¢ 0.25¢ (.22¢ 32¢, 147, 12.3 7 0.40¢ 0.25¢ (.22¢ 32¢, 147, 112.3 7 0.40¢ 0.25¢ (.22¢ 32¢, 147, 112.3 7 0.40¢ 0.25¢ (.22¢ 32¢, 147, 112.3 8 (.399 0.05\$ 0.56 32¢, 15¢, 112.6 9 0.40\$ 0.00\$ 0.00\$ 320, 15¢, 112.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.6 1 (.396 0.02\$ 0.00\$ 323, 0 113.9 1 (.396 0.02\$ 0.00\$ 323, 0 113.9 1 (.396 0.02\$ 0.00\$ 323, 0 113.9 1 (.396 0.02\$ 0.00\$ 323, 0 113.9 1 (.396 0.02\$ 0.00\$ 323, 0 113.9		6.20	156.9	117.0	1205.0	842.0	0.89	05.9	3.10	0.0			
68.0 7.80 1.55 14.72¢ 68.0 7.80 1.55 14.72¢ 68.0 7.80 0.88 27.293 71.0 10.50 0.28 52.42¢ 71.0 10.80 0.86 52.42¢ 71.0 11.20 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.40, 0.00 ***** T* P*/T* W*T**.44 FT/5 FT/5 FT/5 70.40¢ 0.237 0.353 319.7 154.8 112.3 70.40¢ 0.25¢ 0.25¢ 320.4 144.¢ 112.¢ 70.40¢ 0.237 0.353 319.7 154.8 112.2 70.400 0.167 0.291 320.9 176.¢ 112.¢ 70.403 0.05¢ 0.26¢ 320.¢ 169.¢ 112.¢ 70.403 0.05¢ 0.26¢ 320.¢ 169.¢ 112.¢ 70.403 0.005 0.46¢ 320.¢ 169.¢ 112.¢ 70.403 0.006 0.46¢ 320.¢ 169.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 323.0 176.¢ 112.¢ 70.406 0.20¢ 0.20¢ 120.9 112.¢ 70.406 0.20¢ 0.20¢ 0.20¢ 120.9 112.¢ 70.406 0.20¢ 0.20		6.30	163 .9	114.0	1246.0	844.0	61.0	92.9	2.70	6.283			
68.0 7.80 1.55 14.72¢ ¢£.0 8.30 0.88 27.293 71.0 10.50 0.53 39.859 71.0 10.50 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.40 0.00 127.8 70.405 0.233 0.0 320.0 127.8 8 0.405 0.256 320.0 154.8 112.2 9 0.406 0.167 0.291 320.0 156.8 112.6 10 0.403 0.056 0.260 320.0 156.8 112.6 11 0.408 0.058 0.608 320.0 156.8 112.9 11.40 1.50 1.60 2.00.0 2.25 2.50 2.50 265.0 266.0 2.00 2.25 2.50 2.50 2.50 106.5 106.		6.30	163.9	113.0	1229.0	843.0	61.0	7.10	2.20	11.192			
4£.0 8.30 0.88 27.293 71.0 10.50 0.53 39.859 71.0 10.50 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.1.20 0.26 64.992 71.0 11.40 0.00 ****** 7 0.404 11.40 0.00 320.0 8 0.405 0.25C (.22C 320.4 144.8 112.3 9 0.406 0.237 0.353 319.7 154.8 112.4 1 0.404 0.25C (.22C 320.4 144.8 112.4 1 0.406 0.353 319.7 154.8 112.6 1 0.409 0.056 0.546 320.6 156.1 112.6 1 0.403 0.058 0.608 320.9 176.4 112.9 1 0.405 0.008 0.406 323.0 143.1 112.9 1 0.405 0.000 ***** <td></td> <td>6.20</td> <td>166.0</td> <td>114.0</td> <td>1245.0</td> <td>860.0</td> <td>0.89</td> <td>7.80</td> <td>1.55</td> <td>14.126</td> <td></td> <td></td> <td></td>		6.20	166.0	114.0	1245.0	860.0	0.89	7.80	1.55	14.126			
71.0 10.50 0.53 39.859 71.0 10.80 0.36 52.425 71.0 11.20 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.40, 0.00 ***** T* P*/T* W*T**.44 FT/S FT/S FT/S 0.405 0.333 0.0 320.0 127.8 112.3 7 0.404 0.257 0.353 319.7 154.8 112.2 7 0.406 0.167 0.391 320.9 158.1 112.6 8 (.399 0.058 0.668 320.6 169.8 112.6 1 0.405 0.008 0.704 323.0 176.4 112.9 1 0.405 0.000 ***** 321.4 ***** 112.8 1 1.40 1.50 1.60 2.00. 2.05 2.50 2.50 2.50 2.50 0.50		6.20	167.0	115.0	1240.0	862.0	66.0	8.30	0.88	27.293			
71.0 10.80 0.36 64.992 71.0 11.20 0.26 64.992 71.0 11.20 0.26 64.992 71.0 11.40, 0.00 ***** T** P*/T* H*T**.44 UP FT/S FT/S FT/S 0.405 0.405 0.25G (c.22C 320.0 127.8 112.3 0.406 0.237 0.353 319.7 154.8 112.4 112.2 0.403 0.055 0.546 320.6 169.8 112.4 112.2 0.403 0.005 0.668 320.9 176.4 112.9 0.403 0.0058 0.668 320.9 176.4 112.8 112.2 0.403 0.0058 0.704 323.0 176.4 112.8 112.8 0.405 0.000 ***** 321.4 ***** 112.8 112.8 11.40 1.50 1.60 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2		2.90	171.9	124.0	1180.0	887.0	11.0	10.50	0.53	35.859			
71.0 11.20 0.26 64.992 71.0 11.40, 0.00 ***** T* P*/T* H*T**.44 UP FT/S FT/S FT/S C.22C 320.0 127.8 112.3 7 0.405 0.333 0.0 320.0 127.8 112.3 7 0.404 0.25C (.22C 320.4 144.8 112.4 112.2 8 0.405 0.167 0.391 320.9 158.1 112.2 9 0.403 0.058 0.546 320.6 169.8 112.6 1 0.403 0.0058 0.668 320.0 176.4 112.9 1 0.403 0.008 0.704 323.0 176.4 112.8 1 0.405 0.000 ***** 321.4 ***** 112.8 292.0 292.0 2.60.0 2.00. 2.00. 2.25 2.50 2.50 2.60.0 106.5 113.9 106.5 153.9 153.9 153.9 153.9 156.9		6.10	173.1	122.0	1156.0	857.0	11.0	10.80	. 36 .0	52,425			
T** P*/T* H*T**.44 UP FT/S FT/S 5 0.405 0.333 0.0 320.0 127.8 112.3 7 0.404 0.25G C.22G 350.4 144.8 112.4 6 C.404 0.237 0.353 319.7 154.8 112.4 7 0.404 0.25G C.22C 350.4 144.8 112.4 8 C.404 0.237 0.391 320.9 158.1 112.4 9 0.403 0.055 0.546 320.6 169.8 112.6 1 C.398 0.058 0.668 320.6 176.4 112.9 1 C.398 0.003 0.468 320.6 176.4 112.9 1 C.398 0.000 ***** 321.4 ***** 112.8 1 C.398 0.000 ***** 321.4 ***** 112.9 2 2.66.0 1.50 2.00 2.25 2.50 * 2 2 1.50 1.53.9 * ***** <td></td> <td>00-9</td> <td>173.2</td> <td>122.0</td> <td>1172.0</td> <td>875.0</td> <td>0.17</td> <td>11.20</td> <td>0.26</td> <td>64.992</td> <td></td> <td></td> <td></td>		00-9	173.2	122.0	1172.0	875.0	0.17	11.20	0.26	64.992			
T* P*/T* H*T**.44 FT/S FT/S FT/S FT/S FT/S O.405 O.405 O.233 O.0 320.0 127.8 112.3 T O.404 O.25G C.22G 320.4 144.8 112.4 T O.404 O.25G C.22G 320.4 144.8 112.4 T O.400 O.167 O.391 32C.9 158.1 112.2 T O.400 O.167 O.391 32C.9 158.1 112.6 T O.403 O.056 O.566 32O.6 169.8 112.6 T O.403 O.058 O.668 32O.9 176.4 112.9 T O.403 O.008 O.008 O.704 323.0 176.4 112.8 T O.405 O.000 ***** 321.4 ***** 112.8 T O.405 O.000 ***** 321.4 ***** 112.8 T O.405 O.000 T O.405 O.000 T O.405 O.000 T O.405 O.000 T O.405 O.4		6.20	175.0	122.0	1222.0	850.0	71.0	11 -40 ,	00.0	* * * *			
5 0.405 0.333 0.0 320.0 127.8 112.3 7 0.404 0.25G (.22G 320.4 144.8 112.4 6 (.404 0.237 0.353 319.7 154.8 112.4 7 0.400 0.167 0.391 320.9 158.1 112.4 8 (.339 0.055 0.546 320.6 169.8 112.6 9 0.038 0.068 320.9 176.4 112.9 1 (.398 0.003 0.668 320.9 176.5 112.6 1 (.398 0.0028 0.704 323.0 183.1 112.8 1 (.398 0.000 ***** 321.4 ***** 112.3 250.0 1.50 1.50 2.00 2.25 2.50 12.3 266.0 2.69.0 153.0 129.3 116.0 106.5 153.9 129.9 116.0 100.2 10.2 <t< td=""><td>7</td><td>NF B4/S</td><td>L 94/S</td><td>LBM/S</td><td>*</td><td>*</td><td><u>*</u></td><td>p*/1*</td><td>N*T ** -44</td><td></td><td>FT/S</td><td>FT/S</td><td>3</td></t<>	7	NF B4/S	L 94/S	LBM/S	*	*	<u>*</u>	p*/1*	N*T ** -44		FT/S	FT/S	3
7 0.404 0.25G C.22G 320.4 144.8 112.4 6 C.404 0.237 0.353 319.7 154.8 112.2 7 0.400 0.167 0.391 32C.9 158.1 112.2 8 C.399 0.055 0.546 320.6 169.8 112.6 9 0.394 0.058 0.668 320.0 176.4 112.9 1 C.398 0.028 0.704 323.0 176.4 112.2 1 C.398 0.028 0.704 323.0 183.1 112.8 0 0.405 0.000 ***** 321.4 ***** 112.3 292.0 248.0 2.00 2.00 2.25 2.50 2.50 2.26.0 106.5 1106.5 1100.2 133.9 1106.5 1106.5 1133.0 1133.7 116.0 114.9 134.0	S	.C12	1.073	0.0	0.0	0.135	0.405	0 .333	0.0	320.0	127.8	112.3	•
6 C.404 0.237 0.353 319.7 154.8 112.2 7 0.400 0.167 0.391 32C.9 158.1 112.6 8 C.399 0.055 0.546 320.6 169.8 112.6 3 0.394 0.058 0.668 320.0 176.4 112.9 1 C.398 0.028 0.704 323.0 176.4 112.2 1 C.398 0.028 0.704 323.0 183.1 112.8 292.0 329.0 2.00 2.00 2.00 2.25 2.50 2.50 2.26.0 266.0 266.0 269.0 1.60 2.00 2.25 2.50 2.50 2.26.0 106.5 153.9 153.9 129.3 106.5 113.7 116.0	0	.01	1.374	0.351	0.327	0.117	0.404	0.250	C. 22 C	3 20. 4	144.B	112.4	ŏ
7 0.400 0.167 0.391 32C.9 158.1 112.6 6 (.399 0.055 0.546 320.6 169.8 112.6 3 0.394 0.058 0.620 323.0 176.4 112.9 1	9	.011	1.074	0.565	0.526	960.0	C. 404	0.237	0.353	319.7	154.8	112.2	0
6 (.399 0.055 0.546 320.6 169.8 112.6 3 0.394 0.058 0.620 323.0 176.4 112.9 4 0.403 0.028 0.668 320.9 175.5 112.2 1 0.405 0.000 ***** 321.4 ***** 112.3 1.40 1.50 1.60 2.00 2.25 2.50 2.50 2.50 10.50 292.0 248.0 2.00 2.00 2.25 2.50 10.50 106.5 153.9 129.3 106.5 116.0 116.0	0	.011	1.065	0.624	0.585	190.0	0.400	0.167	0.391	320.9	158.1	112.€	•
3 0.394 0.058 0.620 323.0 176.4 112.9 0.403 0.039 0.668 320.9 179.5 112.2 1 C.398 0.0028 0.704 323.0 183.1 112.8 0.405 0.000 **** 321.4 **** 112.8 1.40 1.50 1.60 2.00 2.25 2.50 2.50 2.50 1.50 2.50 1.50 2.50 1.50 2.50 1.53.0 266.0 269.0 153.0 153.0 153.0 153.0 153.0 113.9 129.3 1106.5 113.9 1100.2 130.9 114.9 134.0	0	.011	1-064	0.871	0.818	0.038	(*399	950.0	0.546	320.6	169.8	112.6	ö
1 C.398 0.028 0.704 323.0 175.5 112.2 1 C.398 0.028 0.704 323.0 183.1 112.8 2 0.405 0.000 **** 321.4 **** 112.3 1.40 1.50 1.60 2.00 2.25 2.50 256.0 266.0 269.0 153.0 106.5 153.9 129.3 100.5 133.9 114.9 135.7 116.0	0	.012	1.053	0.584	0. 534	0.023	0.394	0.058	0.620	323.0	176.4	112.9	0
1	1.055 0	.012	1.071	1.067	966-0	0.01	0.403	0.039	0.668	320.9	179.5	112.2	o.
1.40 1.50 1.60 2.00 2.25 2.50 125.0	0	-012	1.064	1.124	1.057	0.011	6.398	0.028	0.704	323.0	183.1	112.8	ō
1.40 1.50 1.60 2.00 2.25 292.0 248.0 266.0 269.0 153.0 106.4 153.9 106.5 153.9 100.2 130.9 114.9	0	-012	1.075	* * * *	* * * * *	000.0	0.405	000-0	* * *	321.4	* *	. 112.3	0.
(10 0.50 0.75 1.00 1.20 1.40 1.50 1.60 2.00 2.25 4) 173.0 195.0 215.0 166.0 292.0 248.0 4) 122.0 127.0 208.0 256.0 266.0 269.0 4) 80.5 85.5 106.5 153.0 4) 80.5 153.0 106.4 153.0 4) 80.5 153.0 106.5 153.9 4) 80.5 100.2 130.9 6) 80.5 130.9 6) 80.5 130.9 6) 80.5 130.9	CK T	EMPERAT	URES (DE	G F1, OPE	N TC ATM	JS PHERE							
#1 173.0 195.0 215.0 166.0 292.0 248.0 #1 122.0 127.0 208.0 266.0 266.0 269.0 #1 #0.5 #5.5 106.4 153.0 153.9 #1 #6.5 106.5 153.9 129.3 #1 #0.5 100.2 130.9 #1 #1 #1 #1 #3 #1 #1 #1 #1 #1 #1 #1	×	0/	0.50	0.75	1.00	1.20	1.40	1.50	1.60	2.00 .	2.25	2.50	
81 122.0 127.0 208.0 266.0 269.0 A1 60.5 85.5 106.4 153.0 B1 8C.1 86.5 153.9 A1 106.5 153.9 B2 100.2 130.9 B3 135.7 B3 114.9	L C J	70	173.0	195.0	215.0	1.66.0	292.0		248.0				
A1 60.5 85.5 106.4 153.0 81 86.5 106.5 153.9 A1 100.2 130.9 A1 135.7 E1 114.9	THE (POSITION	81	122.0	127.0	208.0	256.0	266.0		269.0				
86.5 106.5 153.9 A) 103.9 129.3 B) 100.2 130.9 A) 135.7 E) 114.9	SHEDUC (PCS IT	4.4	80.5		85.5			106.4		153.0	٠		
4) 100.2 120.9 129.3 100.2 130.9 A) 135.7 E)	SHED UD (POSIT	9.1	80.1		86.5			106.5		153.9			
8) 100.2 130.9 A) 135.7 E) 114.9	RING 1 (POSIT	7								103.9	129.3		
135.7 8)		e,								100.2	130.9		
114.9	111	4)									135.7	116.0	
		6)									114.9	134.0	

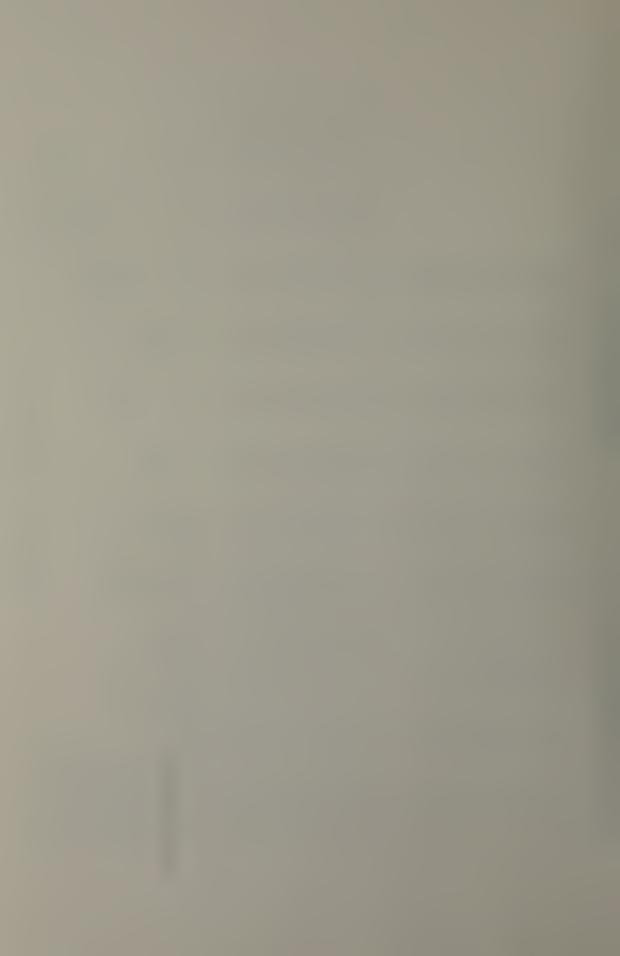


OATA TAKEN BY J A	MIXING STACK LEN MIXING STACK OLAN MIXING STACK L'OS STANOCFF RATIO: AMBIENT PRESSURE:
	CHES INCHES
OATE: 18 AUG 79	NIMEER OF PRIMARY NOZZLES: FRIMARY NOZZLE OJAMETER: ZOTZKE CIZMETEP: 7.510 ING SPEE RATICAMIAP: 2.50

	_									
	UMACH	.0643	1590-	.0642	•0636	•0636	.0641	.0041	.0641	. 0642
	FT/S	112.5	111.9	112.3	111.3	1111.1	111.9	112.1	112.2	112.6
	FT/S	128.0	143.0	152.6	156.6	167.7	174.7	178.9	180.7	* * * * *
SEC AREA 0.0 0.0 6.283 11.192 14.72¢ 27.293 35.859 52.425 64.992 *****	FT/S		318.9	319.8	217.0	316.2	318.5	319.2	319.3	320°6
PA-PS 1N H20 3.03 2.30 1.84 1.55 0.86 0.36 0.36	55" ** 1 * M	0.0	0.204	0.324	0.395	0.545	619.0	C.671	669.0	* * * * * * * * * * * * * * * * * * * *
IN H20 6.30 6.30 7.30 7.50 8.20 8.80 8.80	P*/T*	0.328	C.25G	0.199	0.171	0.095	0.058	0.035	0.027	00000
1AMB 066 F 70.0 70.0 70.0 70.0 70.0	<u>*</u>	0.404	904.0	0.404	0.404	0.405	0.405	0.404	C. 404	0.402
11UPT 851.0 846.0 851.0 851.0 848.0 850.0	* å.	0.132	0.101	0.081	690.0	0.038	0.023	9-7-0	0.011	0.000
TAURN 0EG F 1226.0 1225.0 1221.0 1221.0 1227.0 1227.0 1227.0 1227.0 1234.0 1234.0 1226.0	* 3	0.0	0.303	0. 483	0.588	0.811	0.922	666.0	1.033	5 to the state of
FHZ HZ 103.0 103.0 103.0 103.0 103.0 103.0 103.0	L8M/S	0.0	0.323	0.514	0.621	0.658	0.983	1.066	1.101	* * * *
190.2 190.2 190.2 190.3 190.8 190.6 190.6 191.4	LAY/S	1.064	1.064	1.065	1.356	1.058	1.067	1,067	1.067	1.067
14 F2 14 F2 6.50 6.50 6.40 6.50 6.50 6.50 6.50	L EM/S	0.010	0.010	0.010	0.010	0.010	C.010	C.010	0.010	C. 010
P.H. HG 4.10 4.10 4.10 4.30 4.30 4.30	MPA LP4/S	1.054	1.054	1.055	1.046	1.047	1.057	1. 057	1.056	1.056
X 4 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ž	-	7	m	4	S	U	_	œ	0

	2,50					÷	7	2 115.8	
	2.25					130.	131.7	137.2	
	2.0ò			156.7	157.9	103.3	9° 66		
	1.60	269.0	266.0						
	1.50			104.0	103.5				
	1.40	286.0	272.0						
N TO ATMOSPHERE	1.20	. 156.0	250.0						
	1.00	194.0	206.0	81.8	82.1				
EG F.1. OP	97.0	180.0	112.0						
RATURES (06	05.0	162.0	****	76.8	76.3				
MIXING STACK TEMPERATURES (DEG F). OPEN TO ATMOSPHERE	0/x	THE (POSITION A)	TMS (POST TION 8)	SHROUD (PRS17 A)	\$H#300 (00511 8)	RING 1 (FCSIT A)	PING 1 (POSIT B)	PING 2 (POSIT A)	OLAC 2 VECS IT BY

Table IV; (Continued)



EXIT PLANE TEMPERATURE DATA UPTAKE TEMPERATURE: 866.0 DEG F

DIA METRAL POSITION	HUPIZONTAL TRAVERSE	L TAGENAL TRAVERSE	T(H)/TUPT	T(U)/TUPT
0.0	449.0	398.0	0.685	0.647
0.25	452.0	432.0	0.688	0.673
0.50	468.J	44 E • C	0.700	0.685
U./5	485.0	454.0	0.713	0.689
1.00	496.0	466.0	0.721	0.648
1.25	511.0	400.0	0.732	0.709
1.50	526.0	492.0	0.744	0.718
1.75	542.0	510.0	0.756	0.731
2.00	550.0	526.0	0.766	0.744
2.25	570.0	544.0	0.777	0.757
2.50	579.0	557.0	0.784	0.767
2.75	588.0	573.0	0.790	0.779
3.00	597.0	585.0	0.797	0.788
3.25	601.0	596.0	0.800	0.796
3.50	004.0	604.0	0. 802	0.802
3.75	oJ 3. O	607.0	0.802	0.805
4.00 .	598.0	602.0	0.798	0.801
4.25	548.0	533.0	G.79C	0.794
4.50	576.0	587.C	0.781	0.790
4 - 75	564.0	517.0	0.772	0.782
5.00	552.0	507.0	0.763	0.774
5.25	539.0	550.0	0.753	0.704
> • 5℃	0.65c	545.0	0.144	0.753
5.75	510.0	531.0	0.731	0.747
6.00	458.0	520.0	0.722	0.739
6.25	480.0	506.0 ·	0.713	0.723
6.50	474.0	49:.C	0.704	0.719
6.75	464.0	484.0	0.697	0.712
7.00	450.0	474.0	0.686	0.704
7.25	440.0	455.0	0.679	0.693

Table V. Exit Plane Temperature Profiles, Solid Wall
Mixing Stack



EXIT PLANE TEMPERATURE OATA

DIAMETRAL POSITION	HCRIZONT AL TRA VERSE	CIAGON AL TRAVERSE	T(H)/TUPT	T(D)/TUPT
0.0	162.0	164.0	0 • 6 16	0.618
0.25	182.0	174.0	0.636	0.628
C. 50	210.0	190.0	0 •664	0.644
0.75	238.0	229.0	0.692	0.683
1.00	272.0	239.0	0.725	0.693
1.25	272.0	274.0	0.725 .	0.727
1.50	288.0	291.G	0.741	0.744
1. 75	303.0	310.0	0.756	0.763
2.30	312.0	312.0	0.765	0.765
2.25	322.0	329.0	0.775	0.781
2. 50	330.0	337.0	0.783	0.790
2.75	333.0	346 • 0	C. 786	0.799
3. CC	344.0	353.0	0.797	0.806
3.25	350.0	356.0	0.803	0.809
3.50	351.0	360.0	C. 804	0.813
3. 75	352.0	365.0	0.805	0.818
4.00	357.0	366.0	C. 810	C. 819
4.25	360.0	362.0	0.813	0.815
4.50	36 2 • 0	366.0	0.815	0.819
4.75	36 2 • 0	366.C	0.815	0.819
5. C C	366.0	366.0	0.819	0.819
5.25	365.0	362.0	0.818	0.815
5. 5C	365. C	360.0	0.818	0.813
5.75	364.0	357.0	0.817	0.810
6.00	362.0	352.0	C. 815	0.805
€. 25	355.0	337.0	0.808	0.790
6.50	352.0	332.0	0.805	0.785
6.75	346. C	322.0	0.799	0.775
7. 00	344.0	314.0	U •797	0.767
7.25	342.0	302.0	0.795	0.755
7.5C	341.0	297.0	0.794	0.750
7.75	328.0	290.0	0.781	0.743
8-0C	32G• O	263.0	0.773	0.716
€. 25	294.0	247 .0	0.747	0.701
8.50	259.0	221.0	0.712	0.675
٤. 75	234.0	197.0	0.688	0.651
9.00	188.0	174.0	0.642	0.628
9.25	174.0	166.0	0.628	0.620

Table VI. Exit Plane Temperatures, Slotted and Shrouded Mixing Stack with One Diffuser Ring

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EXIT FLANE TEMPERATURE CATA

CIAMETRAL PCSITION	HOR IZONTA L TRAVERS E	DIAGONAL TRAVEPSE	T(H)/TUPT	T(D)/TUPT
C.0	149.0	162.C	0.603	0.616
C. 25	170.0	171.0	0.624	0.625
0.50	192.0	187.0	0.645	0.640
C. 75	214.0	205.0	0.667	0.658
1.00	232.0	228 •0	0.685	0.681
1.25	253.0	248.0	0.706	0.701
1. 50	266.0	270.0	0.719	0.723
1.75	284.0	285.0	0.737	0.738
2.00	303.0	300.0	0 . 75 5	0.752
2.25	316.0	314.0	0.768	0.766
2.50	324.0	328.0	0.776	C. 780
2. 75	334.0	340.0	0,786	0.792
3.00	348.0	356 •0	0.800	0.808
3.25	360.0	367.0	0.812	0.819
3.5C	371.0	379.0	0.823	0.831
3.75	382.0	390.0	0.834	0.842
4.00	291.0	398.C	0.743	0.849
4.25	396.0	403.0	0.847	0.854
4 • 50	404.0	406.0	0.855	0.857
4. 75	4C4. C	404.0	0.855	0.855
5.00	404.0	404 •0	0.855	0.855
5.25	402.0	404.0	0. 853	0.855
5.50	397.0	400 •0	0 •848	0.851
5.75	388.0	394.0	C. 840	0.845
6. CO	376.0	387.0	0.828	0.839
6.25	366 •0	377.0	0.818	0.829
6.50	356.0	362.0	0.808	0.814
6.75	340.0	350.0	0.792	0.802
7.00	327.0	340.0	C.779	0.792
7.25	317-C	326.0	C. 769	0.778
7. 5 C	303.0	312.0	0.755	0.764
7.75	281.0	297.0	0.734	0.749
ۥ CO	252. C	274.0	0.705	0.727
8.25	228.0	252 •0	0.681	0. 70 5
€.50	205.0	232• 0	0.658	0.685
٤. 75	175.0	205.0	0.630	0.658
9.00	145.0	178.0	C• 599	0.632
s. 25	121.0	164.0	0.575	0.618

Table VI (Continued)



ENT T PLANE TEMPERATURE DATA

0.0 182.0 189.0 0.582 0.589 0.25 213.0 214.0 0.611 0.611 0.50 245.0 237.0 0.640 0.632 0.75 272.0 266.0 0.664 0.659 1.00 306.0 292.0 0.695 0.682 1.25 335.0 322.0 0.721 0.710 1.50 357.0 345.0 0.741 0.730 1.75 372.0 356.0 0.755 0.740 2.00 382.0 362.0 0.764 0.766 2.25 399.0 381.0 0.773 0.763 2.50 398.0 390.0 0.777 0.771 3.00 413.0 406.0 0.792 0.786 3.25 417.0 418.0 0.796 0.797 2.50 424.0 422.0 0.805 0.805 4.00 430.0 434.0 0.806 0.811 4.25 433.0 435.0 0.811 0.813 4.75 428.0 433.0 0.806 0.811 4.75 428.0 433.0 0.806 0.811 5.00 427.0 432.0 0.805 0.805 5.50 419.0 427.0 0.793 0.805 5.50 429.0 430.0 0.806 0.810 6.10 0.812 6.50 434.0 436.0 0.811 0.813 6.75 427.0 431.0 0.805 0.806 6.811 6.80 437.0 436.0 0.806 0.810 6.80 427.0 432.0 0.805 0.809 5.25 422.0 432.0 0.805 0.809 5.25 423.0 432.0 0.805 0.809 5.25 423.0 432.0 0.805 0.809 5.25 423.0 432.0 0.805 0.809 5.25 423.0 432.0 0.773 0.778 6.25 392.0 406.0 0.773 0.786 6.25 392.0 406.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 235.0 343.0 0.712 0.779 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0 0.602 0.604 8.52 176.0 174.0 0.577 0.575	CLAMETRAL	HORIZONTAL	DIAGONAL	T(H)/TUPT	T(D)/TUPT
0.25 213.0 214.0 0.611 0.611 0.50 245.0 237.0 0.640 0.632 0.75 272.0 266.0 0.664 0.659 1.00 306.0 292.0 0.695 0.682 1.25 335.0 322.0 0.721 0.710 1.50 357.0 345.0 0.741 0.730 1.75 372.0 356.0 0.755 0.740 2.00 382.0 362.0 0.764 0.746 2.25 392.0 381.0 0.773 0.763 2.50 398.0 390.0 0.779 0.771 2.15 402.0 394.0 0.782 0.775 3.00 413.0 406.0 0.792 0.786 3.25 417.0 418.0 0.796 0.797 3.50 424.0 422.0 0.802 0.800 3.75 427.0 431.0 0.802 0.808 4.00 430.0<	POSI TI CN	TRAVERSE	TRAV ERSE		
0.50 2+5.0 237.0 0.640 0.632 0.75 272.0 266.0 0.664 0.659 1.00 306.0 292.0 0.695 0.682 1.25 335.0 322.0 0.721 0.710 1.50 357.0 345.0 0.741 0.730 1.75 372.0 356.0 0.755 0.740 2.00 282.0 362.0 0.764 0.746 2.01 282.0 362.0 0.764 0.746 2.25 392.0 381.0 0.773 0.763 2.50 398.0 390.0 0.7779 0.771 2.15 402.0 394.0 0.782 0.775 3.00 413.0 406.0 0.792 0.786 3.25 417.0 418.0 0.796 0.797 3.50 424.0 422.0 0.802 0.802 3.75 427.0 431.0 0.805 0.808 4.00 430.0				0.582	0.589
0.75 272.0 266.0 0.664 0.659 1.00 306.0 292.0 0.695 0.682 1.25 335.0 322.0 0.721 0.710 1.50 357.0 345.0 0.741 0.730 1.75 372.0 356.0 0.755 0.740 2.00 382.0 362.0 0.764 0.746 2.25 392.0 381.0 0.773 0.763 2.50 398.0 390.0 0.779 0.771 2.15 402.0 394.0 0.782 0.775 3.00 413.0 406.0 0.792 0.786 3.25 417.0 418.0 0.796 0.797 3.55 424.0 422.0 0.802 0.800 3.75 427.0 431.0 0.805 0.808 4.00 430.0 434.0 0.808 0.811 4.25 433.0 435.0 0.810 0.812 4.50 434.0 436.0 0.810 0.805 5.05 423.0 432.0<					
1.00 306.0 292.0 0.695 0.682 1.25 335.0 322.0 0.721 0.710 1.50 357.0 345.0 0.741 0.730 1.75 372.0 356.0 0.755 0.740 2.00 382.0 362.0 0.764 0.746 2.25 392.0 381.0 0.773 0.763 2.50 398.0 390.0 0.779 0.771 2.15 402.0 394.0 0.782 0.775 3.00 413.0 406.0 0.792 0.786 3.25 417.0 418.0 0.796 0.797 3.50 424.0 422.0 0.802 0.800 3.75 427.0 431.0 0.805 0.808 4.00 430.0 434.0 0.805 0.811 4.25 433.0 435.0 0.810 0.812 4.50 434.0 435.0 0.810 0.812 4.50 434.0 435.0 0.810 0.812 4.50 434.0 432.0 0.806 0.811 5.00 427.0 432.0 0.806 0.810 5.00 427.0 432.0 0.805 0.809 5.25 423.0 432.0 0.805 0.809 5.25 423.0 432.0 0.806 0.810 5.00 427.0 422.0 0.793 0.805 5.50 419.0 427.0 0.793 0.805 5.50 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.800 6.50 388.0 397.0 0.769 0.707 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 0.757 0.772 7.00 370.0 381.0 0.757 0.772 7.00 370.0 381.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 356.0 374.0 0.772 7.00 370.0 381.0 0.757 7.50 340.0 360.0 0.712 0.729 8.00 305.0 322.0 0.602 0.604 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0 0.602 0.602			237 •0	0.640	0.632
1.25 335.0 322.0 0.721 0.710 1.50 357.0 345.0 0.741 0.730 1.75 372.0 356.0 0.755 0.740 2.00 382.0 362.0 0.764 0.746 2.25 392.0 381.0 0.773 0.763 2.50 398.0 390.0 0.779 0.771 2.15 402.0 394.0 0.782 0.775 3.00 413.0 406.0 0.792 0.786 3.25 417.0 418.0 0.796 0.797 3.50 424.0 422.0 0.802 0.800 3.75 427.0 431.0 0.805 0.808 4.00 430.0 434.0 0.808 0.811 4.25 433.0 435.0 0.810 0.812 4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 0.809 5.25 423.0 432.0<			266.0	0.664	0.659
1.50				0 •6 95	0.682
1.75 372.0 356.0 0.755 0.740 2.00 382.0 362.0 0.764 0.746 2.25 392.0 381.0 0.773 0.763 2.50 398.0 390.0 0.779 0.771 2.15 402.0 394.0 0.782 0.775 3.00 413.0 406.0 0.792 0.786 3.25 417.0 418.0 0.796 0.797 2.50 424.0 422.0 0.802 0.800 3.75 427.0 431.0 0.805 0.808 4.00 430.0 434.0 0.808 0.811 4.25 433.0 435.0 0.808 0.811 4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.811 0.813 4.75 428.0 433.0 0.806 0.811 0.809 5.25 423.0 432.0 0.806 0.810 0.809 5.75 410.0 427.0 0.793 0.805	1.25	335.0	322.0	0.721	0.710
2.00 382.0 362.0 0.764 0.746 2.25 392.0 381.0 0.773 0.763 2.50 398.0 390.0 0.779 0.771 2.75 402.0 394.0 0.782 0.775 3.00 413.0 406.0 0.792 0.786 3.25 417.0 418.0 0.796 0.797 3.50 424.0 422.0 0.802 0.800 3.75 427.0 431.0 0.805 0.808 4.00 430.0 434.0 0.808 0.811 4.25 433.0 435.0 0.810 0.812 4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 0.809 5.25 423.0 432.0 0.805 0.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.805 6.75 374.0 391.0<	1. 50	357.0	345.0	0.741	
2.25 392.0 381.0 0.773 0.763 2.50 398.0 390.0 0.779 0.771 2.75 402.0 394.0 0.782 0.775 3.00 413.0 406.0 0.792 0.786 3.25 417.0 418.0 0.796 0.797 3.50 424.0 422.0 0.802 0.800 3.75 427.0 431.0 0.805 0.808 4.00 430.0 434.0 0.808 0.811 4.25 433.0 435.0 0.810 0.812 4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 0.809 5.25 423.0 432.0 0.801 0.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.800 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0<	1.75	372.0	356 •0	0.755	0.740
2.50 398.0 390.0 0.779 0.771 2.75 402.0 394.0 0.782 0.775 3.CC 413.0 406.0 0.792 0.786 3.25 417.0 418.0 0.796 0.797 3.50 424.0 422.0 0.802 0.800 3.75 427.0 431.0 0.805 0.808 4.00 430.0 434.0 0.808 0.811 4.25 433.0 435.0 0.810 0.812 4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 C.809 5.25 423.0 432.0 0.805 C.809 5.5c 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.800 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 C.769 0.778 6.75 374.0 391.0<	2.00	382.0	362.C	0.764	0.746
2.75 402.0 394.0 0.782 0.775 3.CC 413.0 406.0 0.792 0.786 3.25 417.0 418.0 0.796 0.797 2.50 424.0 422.0 0.802 0.800 3.75 427.0 431.0 0.805 0.808 4.00 430.0 434.0 0.808 0.811 4.25 433.0 435.0 0.810 0.812 4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 0.809 5.25 423.0 432.0 0.805 0.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.800 6.00 402.0 418.0 0.732 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 0.769 0.778 6.75 374.0 391.0<	2.25		381.0	0.773	0.763
3. CC 413.0 406.0 0.792 0.786 3.25 417.0 418.0 0.796 0.797 2. 50 424.0 422.0 0.802 0.800 3.75 427.0 431.0 0.805 0.808 4.00 430.0 434.0 0.808 0.811 4.25 433.0 435.0 0.810 0.812 4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 C.809 5.25 423.0 432.0 0.805 C.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.800 6.00 402.0 418.0 0.732 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 C.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.	2.50	398.0	390.0	C.779	0.771
3.25 417.0 418.0 0.796 0.797 2.50 424.0 422.0 0.802 0.800 3.75 427.0 431.0 0.805 0.808 4.00 430.0 434.0 0.808 0.811 4.25 433.0 435.0 0.810 0.812 4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 C.809 5.25 423.0 432.0 0.805 C.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 427.0 0.793 0.805 6.00 402.0 418.0 0.732 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 C.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 356.0 374.0<	2.75	402.0	394.0	0.782	0.775
3.50 424.0 422.0 0.802 0.800 3.75 427.0 431.0 0.805 0.808 4.00 430.0 434.0 0.808 0.811 4.25 433.0 435.0 0.810 0.812 4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 C.809 5.25 423.0 432.0 0.805 C.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 427.0 0.793 0.805 6.00 402.0 418.0 0.732 0.797 6.25 392.0 406.0 0.732 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 C.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 356.0 374.0<	3. CC	413.0	406.0	0.792	0.786
3.75 427.0 431.0 0.805 0.808 4.00 430.0 434.0 0.808 0.811 4.25 433.0 435.0 0.810 0.812 4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 C.809 5.25 423.0 432.0 0.805 C.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 427.0 0.793 0.805 6.00 402.0 418.0 0.782 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 C.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 356.0 374.0 C.740 0.757 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0<	3.25	417.0	418.0	0.796	0.797
4.00 430.0 434.0 0.808 0.811 4.25 433.0 435.0 0.810 0.812 4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 C.809 5.25 423.0 432.0 0.801 0.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.800 6.00 402.0 418.0 0.732 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 C.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 356.0 374.0 C.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0<	3.50	424.0	422.0	0 •802	0.800
4.25 433.0 435.0 0.810 0.812 4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 0.809 5.25 423.0 432.0 0.801 0.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.800 6.00 402.0 418.0 0.732 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 0.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 356.0 374.0 0.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0<	3.75	427 •0	431.0	0.805	0.808
4.50 434.0 436.0 0.811 0.813 4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 0.809 5.25 423.0 432.0 0.801 0.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.800 6.00 402.0 418.0 0.732 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 0.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 356.0 374.0 0.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0<	4.00	430.0	434.0	0.808	0.811
4.75 428.0 433.0 0.806 0.810 5.00 427.0 432.0 0.805 C.809 5.25 423.0 432.0 0.801 0.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.800 6.00 402.0 418.0 0.732 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 C.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 256.0 374.0 C.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 28 2.0 294.0 0.673 0.684 8.50 247.0 265.0 0.641 0.628 9.00 203.0 206.0	4. 25	433.0	435 • 0	0.810	0.812
5.00 427.0 432.0 0.805 C.809 5.25 423.0 432.0 0.801 0.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.800 6.00 402.0 418.0 0.732 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 C.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 256.0 374.0 C.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0 0.641 0.658 8.75 233.0 232.0 0.602 0.604 9.00 203.0 206.0<	4.50	434.0	436.0	0.811	0.813
5.25 423.0 432.0 0.801 0.809 5.50 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.800 6.00 402.0 418.0 0.732 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 0.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 256.0 374.0 0.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0 0.641 0.658 8.75 233.0 232.0 0.602 0.602 9.00 203.0 206.0 0.602 0.604	4. 75	428.0	433.0	0.806	0.810
5.5C 419.0 427.0 0.793 0.805 5.75 410.0 422.0 0.789 0.800 6.C0 402.0 418.0 0.732 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 0.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 256.0 374.0 0.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0 0.641 0.658 8.75 233.0 232.0 0.602 0.604 9.00 203.0 206.0 0.602 0.604	5.00	427.0	432 •0	0.805	C.809
5.75 410.0 422.0 0.789 0.800 6.00 402.0 418.0 0.732 0.797 6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 0.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 356.0 374.0 0.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0 0.641 0.658 8.75 233.0 232.0 0.629 0.628 9.00 203.0 206.0 0.602 0.604	5.25	423.0	432.C	0.801	0.809
6. CO 402.0 418.0 0.732 0.797 6. 25 392.0 406.0 0.773 0.786 6. 50 388.0 397.0 C.769 0.778 6. 75 374.0 391.0 0.757 0.772 7. 00 370.0 381.0 0.753 0.763 7. 25 356.0 374.0 C.740 0.757 7. 50 340.0 360.0 0.726 0.744 7. 75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8. 25 282.0 294.0 0.673 0.684 8. 50 247.0 265.0 0.641 0.658 8. 75 233.0 232.0 0.629 0.628 9. 00 203.0 206.0 0.602 0.604	5.5C	419.0	427.0	0.793	0.805
6.25 392.0 406.0 0.773 0.786 6.50 388.0 397.0 C.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 256.0 374.0 C.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0 0.641 0.658 8.75 233.0 232.0 0.629 0.628 9.00 203.0 206.0 0.602 0.604	5.75	410.0	422.0	0.789	0.800
6.50 388.0 397.0 C.769 0.778 6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 356.0 374.0 C.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0 0.641 0.658 8.75 233.0 232.0 0.629 0.628 9.00 203.0 206.0 0.602 0.604	6. CO	402.0	418.0	0.732	0.797
6.75 374.0 391.0 0.757 0.772 7.00 370.0 381.0 0.753 0.763 7.25 256.0 374.0 0.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0 0.641 0.658 8.75 233.0 232.0 0.629 0.628 9.00 203.0 206.0 0.602 0.604	6.25	392.0	406 •0	0.773	0.786
7.00 370.0 381.0 0.753 0.763 7.25 256.0 374.0 0.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0 0.641 0.658 8.75 233.0 232.0 0.629 0.628 9.00 203.0 206.0 0.602 0.604	6.50	388.0	397.0	C. 769	0.778
7.25 356.C 374.0 C.740 0.757 7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.C 0.641 0.658 8.75 233.0 232.0 0.629 0.628 9.00 203.0 206.0 0.602 0.604	6.75	374.0	391.0	0.757	0.772
7.50 340.0 360.0 0.726 0.744 7.75 325.0 343.0 0.712 0.729 8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0 0.641 0.658 8.75 233.0 232.0 0.629 0.628 9.00 203.0 206.0 0.602 0.604	7.00	370.0	381.0	0.753	0.763
7.75 \$25.0 \$343.0 0.712 0.729 8.00 \$305.0 \$322.0 0.694 0.710 8.25 \$282.0 \$294.0 0.673 0.684 8.50 \$247.0 \$265.0 0.641 0.658 8.75 \$233.0 \$232.0 0.629 0.628 9.00 \$203.0 \$206.0 0.602 0.604	7.25	356.C	374.0	C. 740	0.757
8.00 305.0 322.0 0.694 0.710 8.25 282.0 294.0 0.673 0.684 8.50 247.0 265.0 0.641 0.658 8.75 233.0 232.0 0.629 0.628 9.00 203.0 206.0 0.602 0.604	7.50	340.0	360 .0	0.726	0.744
8.25 28 2.0 294.0 0.673 0.684 8.50 247.0 265.0 0.641 0.658 8.75 233.0 232.0 0.629 0.628 9.00 203.0 206.0 0.602 0.604	7.75	325.0	343.0	0.712	0.729
8.50 247.0 265.0 0.641 0.658 8.75 233.0 232.0 0.629 0.628 9.00 203.0 206.0 0.602 0.604	8.00	305.0	322.0	0.694	0.710
8.75 233.0 232.0 0.629 0.628 9.00 203.0 206.0 0.602 0.604	8.25	28 2.0	294 •0	0.673	0.684
9.00 203.0 206.0 0.602 0.604	8.50	247.0	265.C	0.641	0.658
	٤. 75	233.0	232.0	0.629	0 -629
9. 25 176. C 174. O 0.577 0.575	9.00	203.0	206.0	0.602	0.604
	9. 25	176.C	174.0	0.577	0.575

Table VI (Continued)



EXIT PLANE TEMPERATURE GATA UPTAKE TEMPERATURE: 656.0 DEG F

DIAMFTRAL FCSITICN	HCRIZONTAL TRAVEPSE	DIAGONAL TRA VERSE	T(H)/TUPT	T(0)/TUPT
0.0	155.0	189.0	0.551	0.581
0.25	192.0	208.0	0.584	0.598
0.50	218.0	231.0	0.607	0.619
C. 75	240.0	258.0	0.627	0.643
1.00	277.0	299.0	C. 660	0.680 '
1. 25	31 C. O	319.0	0.690	0.698
1.50	339.0	344 •0	0.716	0.720
1.75	348.0	364.0	0.724	0.738
2. CO	. 364.0	375.0	0.738	. 0.748
2.25	376.0	394.0	0.749	0.765
2.50	386.0	400.0	C.760	0.771
2. 75	396.0	. 410.0	0.767	0.780
3.00	406.0	419.0	0.776	0.788
3. 25	422.0	430.0	0.790	0.797
3.50	427.0	435 • 0	0.795	0.802
2.75	428.0	442.0	0.796	0.808
4. CC	435.0	445.0	0.802	0.811
4.25	439.0	448.0	0.805	0.814
4. 50	438.0	447.0	0.805	0.813
4.75	439.0	449 •0	0.805	0.814
5.00	439.0	446.0	0.867	0.812
5.25	436.0	436.0	0.803	0.803
5.50	425.0	430.0	0.793	0.797
5. 75	412.0	423.0	0.781	0.791
6.00	404.0	410 .0	0.774	0.780
6.25	396.0	395. Q	0.767	0.766
6. 5C	39 4. 0	379.0	0.765	0.752
6.75	377.0	369.0	C.750	0.743
7.CO	364.0	358. C	0.738	0.733
7. 25	349.0	344 •0	0.725	0.720
7 • 50	-336.0	324.0	0.713	0.702
7. 75	315.0	307.0	0.6.94	0.687
8.00	296.0	288.0	0 •677	0.670
8.25	266.0	259.0	C. 650	0.544
ۥ 50	247.0	234.0	0.633	0.622
8.75	231.0	214.0	0.619	0.604
9.00	194.0	196.0	0.586	0.588
9. 25	182.0	160.0	0.575	0.555

Table VI (Continued)



EXIT PLANE TEMPERATURE CATA
UPTAKE TEMPERATURE: 760.0 DEG F

CIAM ETRAL PCSITION	HOR I ZONTAL TR 4V ERS E	DIAGONAL TRAVERSE	T(H)/TUPT	T(0)/TUPT
G-0	209.0	207.0	0.548	0.547
C. 25	236.0	228.0	0.570	0.564
0.50	281.0	258.0	0.607	0.588
C. 75	306. C	298.0	0.628	0.621
1.00	339.0	343.0	0.655	0.658
1.25	356.0	367.0	C.669	0.678
1. 50	384.0	391.0	0.692	0.697
1.75	405 •0	413.0	0. 709	0.715
2.00	415.0	435.0	0.717	0.734
2. 25	431.0	444 •0	0.730	0.741
2.50	442.0	458.C	0.739	0.752
2. 75	456.0	468.0	0.751	0.751
3.00	472.0	479.0	0.764	0.770
3. 25	480.0	486.0	0.770	0.775
3. 50	494.0	497.0	0.782	0.784
3.75	512.0	508.0	0.797	0.793
4. CO	515.0	509.0	0.799	0.794
4.25	518.0	509 •0	0.802	0. 794
4-50	516.0	510.0	C. 800	0.795
4. 75	514.0	510.0	0.798	0.795
5.00	512.0	509.C	0.797	0.794
5. 25	512.0	508.0	0.797	0.793
5.50	506.0	504.0	0.792	0.790
5.75	501.0	494.0	0.788	0.782
6. CC	494.0	486.0	0.782	0.775
6 • 25	482.0	474.0	0.772	0.766
6. 50	470.0	457.0	0.762	0.752
6.75	454.0	446 •0	0.749	0.743
7.00	448.0	426.0	0. 744	0.726
7. 25	427.0	418.0	0.727	0.720
7.50	419.0	402.0	C•720	0.706
7. 75	400.0	390.0	0.705	0.697
E. CO	371.0	372 •0	0.681	0.682
8-25	344-0	342.0	0-659	0.657
ۥ 50	210.0	299.0	0.631	0.522
8.75	272.0	266 •0	0.600	0.595
9.00	238.0	236.0	0.572	0.570
S• 25	212.0	214.0	0.551	0.552

Table VI (Continued)



EXIT PLANE TEMPFOATURE DATA LPTAKE TEMPERATURE: 767.0 DEG F

DIAMETRAL POSITION	H CFI ZONT AL TOAVERSE	DIAGENAL TRAVER SE	T (H)/TUPT	T(D)/TUPT
c. 0	206.0	206.0	0.543	0.543
0.25	231.0	227.0	0.563	C• 56 0
0.50	262.0	257.0	0.588	0.584
0.75	285.0	284.0	0.607	0.606
1.00	325.0	319.0	C. 640	0.635
1.25	360.0	349.0	3 •668	0.559
1. 50	387.0	379.0	0.690	0.684
1. 75	40C. 0	396.0	0.701	0.698
2.00	414.0	414.0	0.712	0.712
2.25	424.0	427.0	C. 720	0.723
2. 5C	439.0	432.0	0.733	0.727
2.75	447.0 .	448.0	0.739	C. 740
3.00	457.0	455.0	0.747	0.746
3. 25	466.0	465.0	0.755	0.754
3.50	472.0	477.0	C. 760	0.764
3. 75	482.0	482.0	0.768	0.758
4.00	485.0	488.0	0.770	0.773
4.25	489.0	490.0	0.773	0.774
4.5C	491.0	490.0	0.775	0.774
4. 75	.489.0	491.0	0.773	0.775
5.00	488.0	486.0	0.773	0.771
5 • 25	486.0	484 •0	0.771	0.769
5.50	476.0	472.0	0. 763	0.760
5. 75	470.0	463.0	0.758	0.752
6.00	463.0	450.0	0.752	0.742
6. 25	454.0	437.0	0.745	0.731
6. 50	443.0	426 •0	0.736	0.722
6.75	423.0	414.0	C• 720	0.712
7 . CO	417.0	398.0	0.715	0.699
7.25	408.0	364.0	0.707	0.671
7.50	391.0	388.C	0.693	0.691
7. 75	373.0	348.0	0.679	0.658
8.00	349.0	314.0	0.659	0.631
8.25	324. 0	283.0	0.639	0 •605
8.50	288.0	256 •0	0.610	0.583
8.75	260.0	230.0	0.587	0.562
5. 00	231.0	212.0	0.563	0.548
9.25	182.0	201.0	0.523	C. 539

Table VI (Continued)



EXIT PLANE TEMPERATURE DATA

DIAMETRAL	HCRIZONT AL	OIAGONAL	T(H)/TUPT	T(D)/TUPT
POSITION	TRAVERSE	TRAVERSE	THITTOPT	1(0)/1001
0.0	208.0	224 •0	0.511	0.524
0.25	251.0	260.0	0.544	0.551
C. 5 C	295.0	294.0	0.578	0.577
0.75	331.0	324.0	0.606	C. 600
1.00	380.0	364.0	0.643	0.631
1.25	410.0	401.0	0.666	0.659
1.50	452.0	429. C	0.698	0.681
1. 75	466.0	449.0	0.709	0.696
2.00	488.0	472.0	0.726 .	0.714
2.25	497.0	482.0	0.733	0.721
2. 50	517.0	498.0	0.748	0.733
2.75	531.0	517.0	C• 759	0.748
3. CC	544. C	534.0	0.769	0.761
3.25	558.0	545 •0	C.779	0.769
3.50	563.0	550.0	0.783	0.773
3. 75	571.0	560.0	0.789	0.781
4.00	572 •0	566.0	C. 790	0.786
4. 25	570.0	567.0	0.789	0.786
4.50	564.0	569.0	0.784	0.788
4.75	365.0	572.C	0.785	0.790
5. CC	566.0	570.0	0.786	0.789
5.25	565.0	562.0	0.785	0.782
5.50	558. C	552.0	0.779	0.775
5.75	551.0	542.0	0.774	0.767
6.00	538.0	527.0	0.764	0.756
6. 25	525.0	509•0	0.754	0.742
6.50	516.0	494.0	0.747	G• 73 O
6. 75	493.0	476.0	0.730	0.717
7.00	483.0	454 •0	0.722	0.700
7.25	465.0	438. C	0.708	0.688
7.5C	45 2.0	427.0	0.698	0.679
7.75	438.0	406 • 0	0.688	0.663
€. OC	410.C	366.0	0.666	0.632
€. 25	376.0	331.0	0.640	0.606
8.50	329.0	302.0	0.604	0.583
ε. 75	295.0	262.0	0.578	0.553
9.00	252.0	238.0	0.545	0.534
9.25	219.0	216.0	C.520	0.517

Table VI (Continued)



EXIT PLAME TEMPERATURE TATA

DIAMETRAL POSITION	HCRIZONTAL TRAVERSE	DIAGONAL	TEHIZTUPT	T(D)/TUPT
0.0	220.0	190.0	0.530	0.407
0.25	248.0	231.0	0.520	0.497
C-50	260.0		0.542	0.529
C. 75	316.0	270.0	0.566	0.558
1.00	351.0	305.0	0.594	0.585
1.25	378.0	341.0	C. 620	0.613
1.50	410.0	381.0	0.641	0.643
1.75	436.0	409.0	0.666	0.665
2. CC	458.0	442.0 458.0	0.685	0.690
2.45			0.702	0.702
2.50	472.0 492.0	474.0 491.0	0.713	0.715
2. 75	504.0		0.728	0.728
3.00	515.0	502.0 518.0	0.738 0.746	0.736
3.25	535.0	532.0	0.748	0.748
3.50	547.0	551.0	C.770	0.759
3.75	500.0	558. C	0.780	0.773
4. CC	567.0	569 •0	0.786	0.779
4.25	575.0	572.0	0.792	0.787 0.790
4.50	579.0	573.0	0.795	0.790
4.75	575.0	572.0	0.792	0.790
5.00	574.0	569.0	0.791	0.787
5. 25	573.0	559.0	0.790	0.780
5.50	566.0	548.0	0.785	0.771
5.75	554.0	540.0	0.777	0.765
6.00	537.0	522 •0	0.763	0.751
6.25	523.0	503. C	0.752	0.737
6.5C	503.0	482.0	0.737	0.721
6.75	489.0	464.0	0.726	0.707
7.00	476.0	449.0	0.716	0.695
7. 25	462.0	426 •0	0.705	0.678
7.50	437.0	399.0	0.686	0.657
7. 75	411.0	365.0	0.666	0.631
8.00	370.0	348.0	0.635	0.618
8.25	332.0	304.0	0.606	0.584
ε. 5C	296.0	275.0	0.571	0.562
8.75	252.0	242.0	0.545	C. 53 7
9.00	215.0	225.0	0.516	0.524
9.25	196.0	218.0	0.502	0.519

Table VI (Continued)



EXIT PLANE TEMPERATURE DATA

C. 0 156.0 173.0 0.604 0.621 0.25 182.0 182.0 C.630 0.630 C. 50 204.0 216.0 0.652 0.663 0.75 222.0 222.0 0.669 0.669 1.00 248.0 248.0 0.695 0.695 1.25 267.0 266.0 0.713 0.712 1.50 290.0 283.0 0.736 0.729 1.15 308.0 298.0 0.754 0.744 2.00 324.0 311.0 0.769 0.757 2.25 331.0 322.0 0.776 0.767 2.50 345.0 332.0 0.790 0.777 2.75 354.0 344.0 0.799 0.789 3.00 362.0 360.0 0.807 0.805 3.25 373.0 368.0 0.817 0.813 3.50 383.0 378.0 0.827 0.822 3.75 390.0 388.0 0.837 0.832 4.00 396.0 393.0	OLAMETRAL POSITION	HCRIZONTAL TRAVERSE	DIAGENAL TRAVERSE	T (H)/TUPT	TEDI/TUPT
C. 50 204.0 216.0 0.652 0.663 0.75 222.0 222.0 0.669 0.669' 1.00 248.0 248.0 0.695 0.695 1.25 267.0 266.0 0.713 0.712 1.50 290.0 283.0 0.736 0.729 1.75 308.0 298.0 0.754 0.744 2.00 324.0 311.0 0.769 0.757 2.25 331.0 322.0 0.776 0.767 2.50 345.0 332.0 0.790 0.777 2.75 354.0 344.0 0.799 0.789 3.00 362.0 360.0 0.807 0.805 3.25 373.0 368.0 0.817 0.813 3.50 383.0 378.0 0.827 0.822 3.75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.	C. 0	156.0	173.0	0.604	0.621
0.75 222.0 222.0 0.669 0.669 1.00 248.0 248.0 0.695 0.695 1.25 267.0 266.0 0.713 0.712 1.50 290.0 283.0 0.736 0.729 1.75 308.0 298.0 0.754 0.744 2.00 324.0 311.0 0.769 0.757 2.25 331.0 322.0 0.776 0.767 2.50 345.0 332.0 0.790 0.777 2.75 354.0 344.0 0.799 0.789 3.00 362.0 360.0 0.807 0.805 3.25 373.0 368.0 0.817 0.813 3.50 383.0 378.0 0.827 0.822 3.75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.51 400.0 399.0<	0.25	182.0	182.0	C. 630	0.630
1.00	C- 50	204.0	216.0	0.652	0.663
1. 25 267.0 266.0 0.713 0.712 1. 50 290.0 283.0 0.736 0.729 1. 75 308.0 298.0 0.754 0.744 2.00 324.0 311.0 0.769 0.757 2.25 331.0 322.0 0.776 0.767 2. 50 345.0 332.0 0.790 0.777 2. 75 354.0 344.0 0.799 0.789 3. 60 362.0 360.0 0.807 0.805 3. 25 373.0 368.0 0.817 0.813 3. 50 383.0 378.0 0.827 0.822 3. 75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.75 400.0 399.0 0.844 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 <	0.75	222.0	222 •0	0.669	0.669'
1.50 290.0 283.0 0.736 0.729 1.75 308.0 298.0 0.754 0.744 2.00 324.0 311.0 0.769 0.757 2.25 331.0 322.0 0.776 0.767 2.50 345.0 332.0 0.790 0.777 2.75 354.0 344.0 0.799 0.789 3.60 362.0 360.0 0.807 0.805 3.25 373.0 368.0 0.817 0.813 3.50 383.0 378.0 0.827 0.822 3.75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.75 400.0 399.0 0.844 0.843 5.00 356.0 399.0 0.844 0.844 5.50 387.0 397.0 0.836 0.841 5.55 392.0 397.0<	1-GO	248.0	248. C	0.695	0.695
1.75 308.0 298.0 0.754 0.744 2.00 324.0 311.0 0.769 0.757 2.25 331.0 322.0 0.776 0.767 2.50 345.0 332.0 0.790 0.777 2.75 354.0 344.0 0.799 0.789 3.00 262.0 360.0 0.807 0.805 3.25 373.0 368.0 0.817 0.813 3.50 383.0 378.0 0.827 0.822 3.75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.834 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.75 400.0 399.0 0.844 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5.75 376.0 388.0 0.820 0.832 6.00 368.0 384.0<	1. 25	267.0	266.0	0.713	0.712
2.00 324.0 311.0 0.769 0.757 2.25 331.0 322.0 0.776 0.767 2.50 345.0 332.0 0.790 0.777 2.75 354.0 344.0 0.799 0.789 3.60 362.0 360.0 0.807 0.805 3.25 373.0 368.0 0.817 0.813 3.50 383.0 378.0 0.827 0.822 3.75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.75 400.0 400.0 0.844 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5.75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.820 0.832 6.50 348.0 362.0<	1.50	290.0	283.0	0.736	0.729
2.25 331.0 322.0 0.776 0.767 2.50 345.0 332.0 0.790 0.777 2.75 354.0 344.0 0.799 0.789 3.60 362.0 360.0 0.807 0.805 3.25 373.0 368.0 0.817 0.813 3.50 383.0 378.0 0.827 0.822 3.75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.75 400.0 399.0 0.844 0.843 5.00 356.0 399.0 0.836 0.844 5.00 356.0 399.0 0.836 0.844 5.00 356.0 399.0 0.836 0.844 5.00 356.0 399.0 0.836 0.841 5.50 387.0 399.0 0.836 0.841 5.50 387.0 399.0<	1.75	308.0	298.0	0.754	. 0.744
2. 50 345.0 332.0 0.790 0.777 2. 75 354.0 344.0 0.799 0.789 3. C0 262.0 360.0 0.807 0.805 3. 25 373.0 368.0 0.817 0.813 3.50 383.0 378.0 0.827 0.822 3. 75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.75 400.0 400.0 0.844 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5. 75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.820 0.832 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.773 0.807 7.25 311.0	2.00	324.0	311.0	0.769	0.757
2.75 354.0 344.0 0.799 0.789 3.00 362.0 360.0 0.807 0.805 3.25 373.0 368.0 0.817 0.813 3.50 383.0 378.0 0.827 0.822 3.75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.75 400.0 400.0 0.844 0.844 5.00 356.0 399.0 0.840 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5.75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.820 0.832 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.773 0.765 7.25 311.0 330.0<	2.25	331.0	322.0	0.776	0.767
3. CO 262.0 360.0 0.807 0.805 3. 25 373.0 368.0 0.817 0.813 3. 50 383.0 378.0 0.827 0.822 3. 75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.75 400.0 400.0 0.844 0.844 5.00 396.0 399.0 0.844 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5.75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.813 0.828 6.25 359.0 373.0 0.804 0.817 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.770 0.788 7.25 311.0 33	2. 50	345.0	332.0	0.790	0.777
3.25 373.0 368.0 0.817 0.813 3.50 383.0 378.0 0.827 0.822 3.75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.75 400.0 400.0 0.844 0.844 5.00 356.0 399.0 0.840 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5.75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.813 0.828 6.25 359.0 373.0 0.804 0.817 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.783 0.795 7.00 325.0 343.0 0.770 0.788 7.25 311.0 330.0<	2.75	354.0	344.0	0. 799	C. 789
3.50 383.0 378.0 0.827 0.822 3.75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.75 400.0 400.0 0.844 0.844 5.00 356.0 399.0 0.840 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5.75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.813 0.828 6.25 359.0 373.0 0.804 0.817 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.773 0.755 7.25 311.0 330.0 0.757 0.775 7.50 3CC.0 320.0 0.746 0.765 7.75 281.0 304.0<	3. GO	362.0	360.0	0.807	0.805
3.75 390.0 388.0 0.834 0.832 4.00 396.0 393.0 0.840 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.75 400.0 400.0 0.844 0.844 5.00 356.0 399.0 0.840 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5.15 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.820 0.832 6.00 368.0 384.0 0.813 0.828 6.25 359.0 373.0 0.804 0.817 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.770 0.788 7.25 311.0 330.0 0.770 0.788 7.75 281.0 304.0 0.727 0.750 8.00 272.0 286.0<	3.25	373.0	368.0	0.817	0.813
4.00 396.0 393.0 0.844 0.837 4.25 400.0 399.0 0.844 0.843 4.50 400.0 399.0 0.844 0.843 4.75 400.0 400.0 0.844 0.844 5.00 356.0 399.0 0.840 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5.75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.813 0.828 6.25 359.0 373.0 0.804 0.817 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.773 0.807 7.00 325.0 343.0 0.770 0.788 7.25 311.0 330.0 0.757 0.775 7.50 300.0 320.0 0.746 0.765 7.75 281.0 304.0 0.727 0.750 8.25 248.0 259.0<	3.50	383.0	378.0	0.827	0.822
4. 25 400.0 399.0 0.844 0.843 4. 50 400.0 399.0 0.844 0.843 4. 75 400.0 400.0 0.844 0.844 5. 00 356.0 399.0 0.840 0.843 5. 25 392.0 397.0 0.836 0.841 5. 50 387.0 394.0 0.831 0.838 5. 75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.813 0.828 6. 25 359.0 373.0 0.804 0.817 6. 50 348.0 362.0 0.793 0.807 6. 75 338.0 350.0 0.783 0.795 7. CC 325.0 343.0 0.770 0.788 7. 25 311.0 330.0 0.757 0.775 7. 50 3CC.0 320.0 0.746 0.765 7. 75 281.0 304.0 0.727 0.750 8. 25 248.0 259.0 0.695 0.705 8. 50 223.0	3. 75	390.0	388.0	0.834	0.832
4.5C 400.0 399.0 0.844 0.843 4.75 400.0 400.0 0.844 0.844 5.00 356.C 399.0 0.840 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5.75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.813 0.828 6.25 359.0 373.0 0.804 0.817 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.783 0.795 7.00 325.0 343.0 0.770 0.788 7.25 311.0 330.0 0.757 0.775 7.50 3CC.0 320.0 0.746 0.765 7.75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0<	4.00	396.0	393.0	C.840	0.837
4.75 400.0 400.0 0.844 0.844 5.00 396.0 399.0 0.840 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5.75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.813 0.828 6.25 359.0 373.0 0.804 0.817 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.783 0.795 7.00 325.0 343.0 0.770 0.788 7.25 311.0 330.0 0.757 0.775 7.50 300.0 0.746 0.765 7.75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8.75 201.0 206.0 0.649<	4. 25	40G. O	399.0	0.844	0.843
5.00 396. C 399.0 0.840 0.843 5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5.75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.813 0.828 6.25 359.0 373.0 0.804 0.817 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.783 0.795 7.00 325.0 343.0 0.770 0.788 7.25 311.0 330.0 0.757 0.775 7.50 300.0 0.746 0.765 0.755 8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8.75 201.0 206.0 0.649 0.653	4.5C	400.0	399 •0	0.844	0.843
5.25 392.0 397.0 0.836 0.841 5.50 387.0 394.0 0.831 0.838 5.75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.813 0.828 6.25 359.0 373.0 0.804 0.817 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.783 0.795 7.00 325.0 343.0 0.770 0.788 7.25 311.0 330.0 0.757 0.775 7.50 300.0 320.0 0.746 0.765 7.75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8.75 201.0 206.0 0.649 0.653	4.75	400.0	400.0	0.844	0.844
5.50 387.0 394.0 0.831 0.838 5.75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.813 0.828 6.25 359.0 373.0 0.804 0.817 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.783 0.795 7.00 325.0 343.0 0.770 0.788 7.25 311.0 330.0 0.757 0.775 7.50 300.0 0.746 0.765 7.75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8.75 201.0 206.0 0.649 0.653	5. 00	396. C	399.0	C-840	0.843
5. 75 376.0 388.0 0.820 0.832 6.00 368.0 384.0 0.813 0.828 6. 25 359.0 373.0 0.804 0.817 6. 50 348.0 362.0 0.793 0.807 6. 75 338.0 350.0 0.783 0.795 7. CC 325.0 343.0 0.770 0.788 7. 25 311.0 330.0 0.757 0.775 7. 50 3CC.C 320.0 0.746 0.765 7. 75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8. 75 201.0 206.0 0.649 0.653	5.25	392.0	397 •0	0.836	0.841
6.00 368.0 384.0 0.813 0.828 6.25 359.0 373.0 0.804 0.817 6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.783 0.795 7. CC 325.0 343.0 0.770 0.788 7.25 311.0 330.0 0.757 0.775 7.50 3CC.C 320.0 0.746 0.765 7.75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8.75 201.0 206.0 0.649 0.653	5.50	387.0	394.0	0.831	0.838
6. 25 359.0 373.0 0.804 0.817 6. 50 348.0 362.0 0.793 0.807 6. 75 338.0 350.0 0.783 0.795 7. C0 325.0 343.0 0.770 0.788 7. 25 311.0 330.0 0.757 0.775 7. 50 3CC.0 320.0 0.746 0.765 7. 75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8. 25 248.0 259.0 0.695 0.705 8. 50 223.0 235.0 0.670 0.682 8. 75 201.0 206.0 0.649 0.653	5. 75	376.0	388.0	0.820	0.832
6.50 348.0 362.0 0.793 0.807 6.75 338.0 350.0 0.783 0.795 7. CC 325.0 343.0 0.770 0.788 7.25 311.0 330.0 0.757 0.775 7. 50 3CC.C 320.0 0.746 0.765 7. 75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8. 25 248.0 259.0 0.695 0.705 8. 50 223.0 235.0 0.670 0.682 8. 75 201.0 206.0 0.649 0.653	6.00	368.0	384.0	0.813	0. 82 8
6.75 338.0 350.0 0.783 0.795 7. C0 325.0 343.0 0.770 0.788 7.25 311.0 330.0 0.757 0.775 7. 50 3CC.C 320.0 0.746 0.765 7. 75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8. 75 201.0 206.0 0.649 0.653	t. 25	359.0	373.0 1	0.804	0.817
7. CC 325.0 343.0 0.770 0.788 7.25 .311.0 330.0 0.757 0.775 7. 50 3CC.C 320.0 0.746 0.765 7. 75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8. 75 201.0 206.0 0.649 0.653	6.50	348.0	362 •0	0.793	0.807
7.25 311.0 330.0 0.757 0.775 7.50 3CC.C 320.0 0.746 0.765 7.75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8.75 201.0 206.0 0.649 0.653	6.75	338.0	350.0	0.783	0.795
7. 50 3CC. C 320.0 0.746 0.765 7. 75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8. 75 201.0 206.0 0.649 0.653	7. CC	325.0	343.0	0.770	0.788
7.75 281.0 304.0 0.727 0.750 8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8.75 201.0 206.0 0.649 0.653	7.25	- 311.0	330.0	0.757	0.775
8.00 272.0 286.0 0.718 0.732 8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8.75 201.0 206.0 0.649 0.653	7. 50	3CC. C	320.0	0,746	0.765
8.25 248.0 259.0 0.695 0.705 8.50 223.0 235.0 0.670 0.682 8.75 201.0 206.0 0.649 0.653	7.75	281.0	304 •0	0.727	0.750
8.50 223.0 235.0 0.670 0.682 8.75 201.0 206.0 0.649 0.653	8-00	272.0	286.0	0.718	0.732
8.75 201.0 206.0 0.649 0.653	8.25	248.0	259.0	0.695	0.705
0.420	8.50	223.0	235.0	0.670	0.682
0.00 172.0 172.0 0.620 0.620	٤. 75	201.0	206.0	0.649	0.653
9.00 172.0 172.0	9.00	172.0	172 .0	0.620	0.620
9.25 159.0 146.0 0.607 0.595	9.25	159.0	146.0		0.595

Table VII. Exit Plane Temperature Plots, Slotted and Shrouded Mixing Stack with Two Diffuser Rings



EXIT PLANE TEMPERATURE DATA UPTAKE TEMPERATURE: 541.0 DEG F

CIAMETRAL POSITION	HOR IZONTAL TRAVERSE	DIAGONAL TRAVERSE	T(H)/TUPT	T(D)/TUPT
0.0	156.0	163.0	0.615	0.622
C.25	176.0	173.0	0.635	0.632
0.50	201.0	188.0	C. 660	0.647
C. 75	226.0	217.0	0.685	0.676
1.00	252.0	243.0	0.711	0.702
1.25	263.0	261.0	0.722	0.720
1.5C	27 7. 0	280.0	0.736	0.739
1.75	294.0	305.0	0.753	0.764
2.00	307.0	306.0	0.766	0.765
2. 25	323.0	328.0	0.782	0.787
2.50	327.0	333.0	0.786	0.792
2.75	333.0 .	343.0	0.792	0.802
3.00	346.0	354 •0	0.805	0.813
3-25	355.0	361.0	0.814	0.820
3. 50	361.0	375.0	0.820	0.834
3.75 ,	367.0	372.0	0.826	0.831
4.00	273.0	382.0	0.832	0.841
4.25	378 •0	381 •0	0.837	0.840
4.50	383.0	386.0	0.842	0.845
4. 75	385.0	385.0	0.844	0.844
5.00	385.0	385.0	0.844	0.844
5. 25	384.0	383.0	0.843	0.842
5. 50	381.0	380 •0	0.840	0.839
5.75	376.0	376.0	0.835	0.835
6. CO	369.0	369.0	0.828	0.828
6.25	360.0	357.0	0.819	0.816
6-50	354.0	347.0	0.813	0.806
6. 75	343.0	336.0	0.802	0.795
7.00	342.0	327.0	0.801	0. 786
7. 25	328.0	314.0	0.787	0.773
7.50	321.0	305.0	0.780	0.764
7.75	- 30 1. 0	293.0	C. 760	0.752
€. CC	286.0	268.0	0.745	0.727
8.25	261.0	248.0	C. 720	0.707
8. 50	235.0	227.0	0.694	0.686
8.75	206.0	200 •0	0.665	0.659
9.00	165.0	176.0	0.624	0.635
9. 25	146.0	165.0	0 •6 05	0.624

Table VII (Continued)



EXIT PLANE TEMPERATURE DATA UPTAKE TEMPERATURE: 651.0 GEG F

DI AMETRAL POSITION	HCRIZONTAL TRAVERSE	D I AGONAL TRAVERSE	T(H)/TUPT	T(D)/TUPT
c. c	155.0	194 •0	0.553	0.589
0.25	164.0	201.0	0.562	0.595
C. 50	191.0	220.0	0.586	0.612
0.75	216.0	242.0	0 • 6 08	0.632
1.00	244.0	264. 0	0.634	0.552
1.25	269.0	286.0	0.656	0.671
1.50	301.0	304.0	0.685	0.688
1. 75	320.0	322.0	0.702	0.704
2.00	331.0	349.0	0.712	0.728
2.25	352.0	359.0	0.731	0.737
2.5C	370.0	367.0	0.747	0.744
2.75	380.0	380.0	0. 756	0.756
3.00	398.0	396.0	0.772	0.770
3 • 25	408.0	410 .0	0.781	0.783
3.50	422.0	.428.0	0.794	0.799
3.75 .	432.0	437.0	0.803	0.807
4.00	443.0	448.0	0.813	0.817
4.25	450.0	450.0	C. 819	0.819
4.50	454.0	454 •0	0.823	0.823
4.75	452.0	454.0	0.821	0.823
5. CG	445-0	455.0	0.815	0.824
5.25	440.0	455 • 0	. C.810	0.824
5.50	434.0	451.0	0.805	0.820
5. 75	421.0	444.0	0.793	0-814
6-00	410.0	435.0 ,	0.783	0.806
6.25	396. 0	422.0	0.770	0.794
6.50	396.0	412.0	0.770	0.785
6.75	376.0	398.0	0.752	0.772
7. CO	364.0	383.0	0.742	0.759
7.25	356.0	378.0	0. 734	0.754
7. 50	352.0	358.0	0.731	0.736
7.75	325.0	339.0	0.706	0.719
8.00	306.0	309. C	0.689	0.692
€.25	278.0	280.0	0.664	0.666
8.50	259.0	248.0	0.647	0.637
٤. 75	220.0	208.0	0.612	0.601
S. CC	186.0	189 •0	0.581	0.584
9.25	171.0	156.0	0.568	0.554

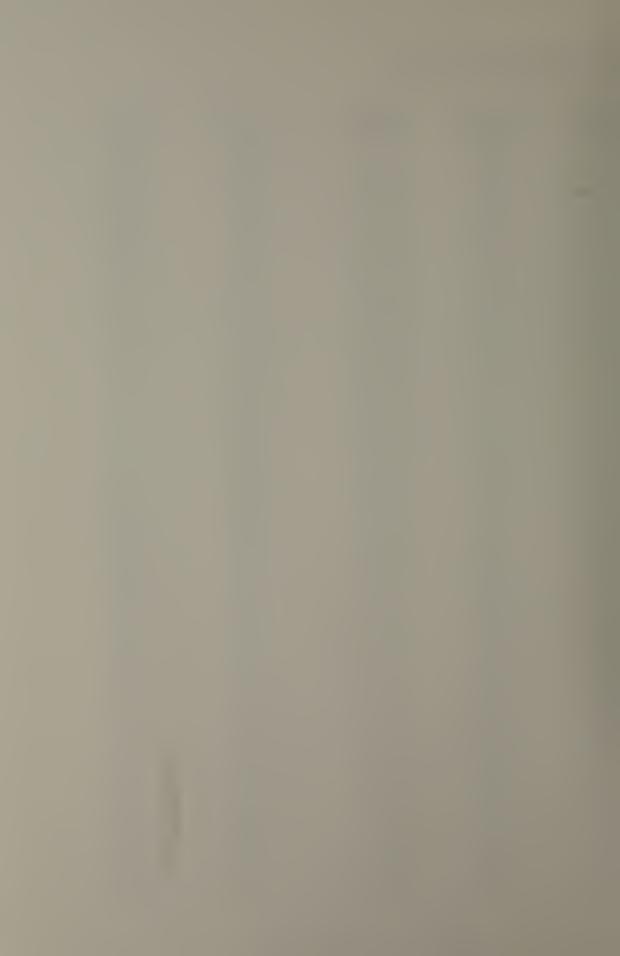
Table VII (Continued)



EXIT PLANE TEMPERATURE DATA UPTAKE TEMPERATURE: 650.0 DEG F

CIAMETRAL FGSI TI CN	HOR IZONTAL TRAVERS E	DIAGONAL TRAVERSE	T(H)/TUPT	T(D)/TUPT
0.0	176.0	160.0	0.573	0.558
C• 25	200.0	206.0	0.575	0.600
0.50	230.0	230.0		
C. 75	253.0	250.0	0.622 0.642	0.622 0.640
1.00	280.0	268.0	0.667	0.656
1.25	307.0	298.0	0.691	0.683
1.50	328.0	318.0	0.710	0.701
1.75	350.0	329.0	0.730	0.711
2.00	365.0	350.0	0.743	0.711
2. 25	380.0	.356 •0	0.757	
2.50	385.0	369•C	0.761	0.735 0.747
2.75	395.0	380.0	0.770	0.757
3.00	402.0	393.0		0.768
3.25	411.0	400 • C	0•777 0•785	0.775
3.5C	413.0			
3.75		412 •0 422 •0	0.786 0.789	0.786 0.795
4.00	416.0 423.0		0.795	
		426.0	C.800	0.798
4.25	428.0	430.0		0.802
4.50	433.0	434.0	0.804	0.805
4. 75	432.0	434.0	0.804	0.805
5.00	427.0	433.0	0.799	0.804
5. 25	421.0	432.0	0.794	0.804
5.50	418.0	428 •0	0.791 0.786	0.800 0.793
5.75	413.0	420+ C		
6.00	406.0		0.780	0.786
6.25	397.0	407.0	0.772 0.763	0.781
6.50	387.0	398.0		0.773
6.75	379.0	392.0	0.756 C.740	0.767 0.758
7.00	362.0	382.0	0.731	0.754
7. 25	35 2 • 0	377.0 363.0	0.724	0.741
7.50	344.0	347. 0	0.706	0.727
7.75	324.0			
8. 00 8. 35	314.0	324.0	0 •697 0• 676	0.706 0.669
8 • 25	291.0	283.0 254.0	0.652	0.643
8.50	264.0		0.635	0.609
8.75	245.0	216.0		
5.00	226.0	186.0	0.618	0.582
9.25	186.0	158.0	0.582	0.557

Table VII (Continued)



EXIT PLANE TEMPERATURE DATA

DIAMETRAL	HCRI ZONTAL TRA VER SE	D IAGENAL TRAVERSE	T (H)/TUPT	T(D)/TUPT
c. c	180.0	211.0	0.525	0.550
0.25	203.0	231.0	0.544	0.567
0.50	236.0	254.0	0.571	0.586
0.75	268.0	283.0	0.597	0.609
1.00	295.0	314.0	0.619	0.635
1.25	324.0	334.0	0.643	0.651
1.50	353.0	360.0	0.667	0.673
1. 75	. 370.0	382.0	0.681	. 0.691
2.00	398.0	394 •0	0.704	0.700
2.25	413.0	410.0	0.716	0.714
2.50	424.0 .	423.0	0.725	0.724
2.75	442.0	435.0	C. 740	0.734
3.00	452.0	448.0	0.748	0.745
3.25	469.0	459.0	0.762	0.754
3.50	484.4	468.0	0.775	0.761
3. 75	498.0	482.0	0.786	0.773
4.00	506.0	493.0	0.792	0.782
4. 25	513.0	498.0	0.798	0.786
4. 5C	517.0	516 •0	108.0	0.801
4.75	522.0	515.0	60، ن	0.800
5. CO .	511.0	511.0	0.796	0.796
5.25	506.0	504.0	0.792	0.791
5.50	494.0	497.0	0.783	0.785
5. 75	488.0	490.0	0.778	o.779
6.00	475.0	482.0	0.767	0.773
€. 25	457.0	470.0	0.752	0.763
6.50	448.0	458.0	0.745	0.753
6. 75	432.0	448.0	0.732	0.745
7. CO	414.0	427.0	0.717	0.728
7.25	- 396.0	414.0	0.702	0.717
7.50	377. C	396.0	0.687	0.702
7.75	357.0	370 •0	0.670	0.681
8.00	330.0	345.0	0.648	0.660
e. 25	296.0	310.0	0 •620	0.632
8-50	264.0	282.0	0. 594	0.609
8.75	229.0	262.0	0.565	0.592
9.00	193.0	210.0	0.536	0.550
9.25	184.0	178.0	0.528	0.523

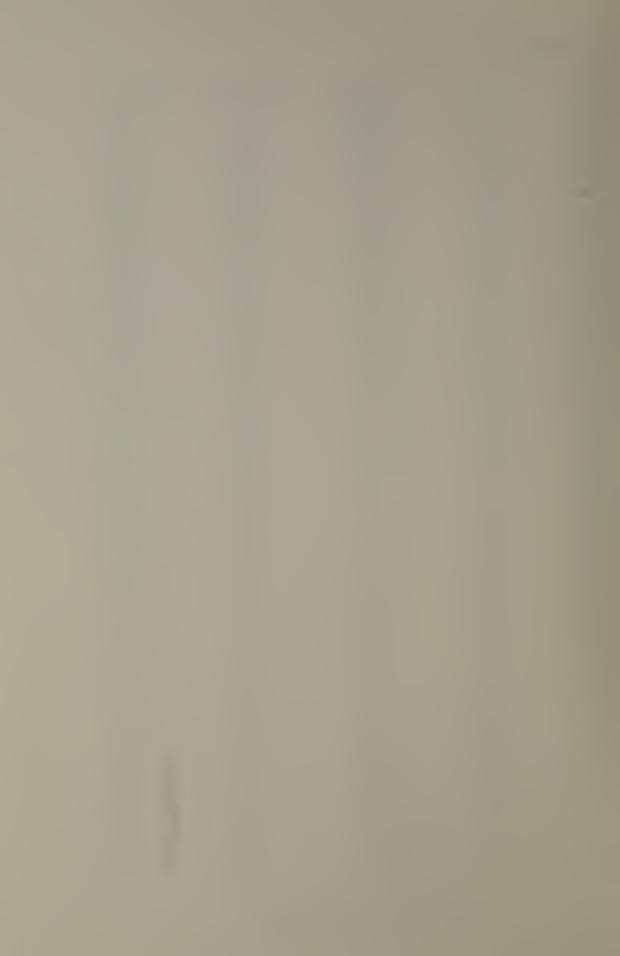
Table VII (Continued)



EXIT PLANE TEMPERATURE DATA UPTAKE TEMPERATURE: 748.0 DEG F

CIAMETRAL POSITION	HORIZONTAL TRAVERSE	D IAGONAL TRAV ERS E	T(H)/TUPT	T(D)/TUPT
0.0	170.0	204.0	0.521	0.550
C. 25	189.0	228.0	0.536	0.569
0.50	215.0	253.0	0. 559	0.590
0.75	242.0	277.0	0.581	0.610
1.00	272.0	304 •0	0.606	0.632
1.25	30 4 • 0	328.C	0.632	0.652
1.5C	340.0	348.0	0.662	0.669
1.75	360.0	376.0	0.679	0.692
2.00	383.0	395.0	0.698	0.708
2.25	397.0	409 •0	0.709	0.719
2.50	418.0	427.0	0.727	0.734
2. 75	435.0	439.0	0.741	0.744
3.00	445 •0	453.0	0.749	0.756
3.25	459.0	471.0	0.761	0.771
3.50	472.0	485.0	0.771	0.783
3.75	485.0	498.0	0.782	0.793
4. GO	496.0	503.0	0.791	0.797
4.25	505.0	510.0	0.799	0.803
4.50	511.0	512.C	0.804	0.805
4. 75	510.0	514.0	0.803	0.806
5.00	505.0	512.0	0.799	0.805
5.25	494.0	506 • 0	0.790	0.800
5.50	492.0	499 •0	0.788	0.794
5.75	482.0	488.0	C. 780	0.785
6 • CO	471.0	472.0	0.771	0.771
6.25	458.0	458.0 -	C.760	0.760
6.50	443.0	443.0	0.747 -	0.747
6. 75	425.0	428.0	0.733	0.735
7.00	412.0	414.0	0.722	0.723
7-25	394.0	403.0	0.707	0.714
7.50	382.0	382.0	0.697	0.697
7. 75	363.0	354.C	0.681	0.674
E. CC	338.0	326.0	0.661	0.651
8.25	306.0	290.0	0.634	0.621
€.50	272.0	253.0	0.606	0.590
8.75	240.0	226.0	0.579	0.568
9.00	195.0	192.0	0.542	0.540
9. 25	173.0	172.0	0 -524	0.523

Table VII (Continued)



EXIT PLANE TEMPERATURE DATA

HCRIZONTAL TRAVERSE	DIAGONAL TRAVERSE	T(H)/TUPT	T(D)/TUPT
200.0	246 •0	0.496	0.531
222.0	268.0	0.513	0.547
25 5. 0	298.0	0.537	0.570
289 •0	338.0	0.563	0.600
324.0	374.0	0.589	0.627
352.0	400.0	0.610	0.647
385.0	421.0	0.635	0.662
418.0	441 - 0	0.660	0.677
440.0	460.0	0.662	0.692
446.0	487.0	0.681	0.712
465.0	505.0	0.695	0.725
487.0	524.0	0.712	0. 740
505.0	540.0	0.725	0.752
524.0	558.0	0 •7 40	0.765
540.0	575.0	0.752	0.778
559.0	588.0	0.766	0.788
572.0	598.0	0.776	0. 795
581.0	602.0	0.783	0.798
588.0	605 •0	0.788	0.801
603.0	602.0	0.799	0.798
592.0	602.0	0.791	0.798
587.0	598.0	0.787	0.795
576. C	591.0	0.779	0.790
566.0	573 •0	0.771	0.777
550.0	558.0	0.759	0.765
538.0	542.0	0.750	0.753
510.0	5∠7 •0	0.729	0.742
493.0	510.0	0.716	0.729
478.0	488.0	0.705	0.713
460.0	462.0	0.692	0.693
436.0	445 • C	0.674	0.680
415.0	423 •0	0.658	0.664
378.0	382.0	C. 630	0.633
348.0	338.0	0.607	0.600
306.0	303.0	0.576	0.574
272.0	245.0	0.550	0.530
227.0	225.0	0.516	0.515
202.0	182.0	0.498	0.483
	TRAVER SE 200.0 222.0 255.0 289.0 324.0 352.0 385.0 418.0 446.0 465.0 487.0 505.0 524.0 540.0 559.0 572.0 581.0 588.0 603.0 592.0 587.0 576.C 566.0 550.0 576.C 566.0 570.0 576.C 566.0 570.0 578.0	TRAVER SE 200.0 246.0 222.0 268.0 255.0 298.0 289.0 338.0 324.0 374.0 352.0 400.0 418.0 441.0 440.0 465.0 505.0 505.0 547.0 558.0 540.0 575.0 588.0 572.0 588.0 602.0 588.0 603.0 602.0 587.0 598.0 576.0 598.0 578.0 598.0	TRAVER SE 200.0

Table VII (Continued)



EXIT PLANE TEMPERATURE DATA
UPTAKE TEMPERATURE: 858.0 DEG F

0.0	CIAMETRAL FCSITION	HOR IZONTAL TRAVERS E	DIAGONAL TRAVERSE	T(H)/TUPT	1(0)/TUPT
0.50	0.0	208.0	208.C	0.507	0.507
0.75 284.0 290.0 0.564 0.569 1.00 314.0 328.0 0.587 0.598 1.25 352.0 358.0 0.616 0.621 1.50 386.0 386.0 0.642 0.642 1.75 409.0 408.0 0.659 0.658 2.00 437.0 435.0 0.680 0.679 2.25 456.0 447.0 0.695 0.688 2.50 472.0 452.0 0.707 0.692 2.75 492.0 475.0 0.722 0.709 3.00 502.0 500.0 0.730 0.728 2.25 512.0 506.0 0.731 0.733 3.50 528.0 524.0 0.750 0.747 3.75 540.0 540.0 0.750 0.747 4.00 544.0 562.0 0.762 0.775 4.25 559.0 561.0 0.773 0.775 4.75 570.0 570.0 0.781 0.781 5.00 562.0 568.0<	C. 25	216.0	230 •0	0.513	0.523
1.00	0.50	249.0	261.0	0.538	0.547
1.25	C. 75	284.0	290.0	0.564	0.569
1.50	1.00	314.0	328 •0	0.587	0.598
1.75	1.25	352.0	358.0	0.616	0.621
2.00 437.0 435.0 C.680 0.679 2.25 456.0 447.0 0.695 0.688 2.50 472.0 452.0 0.707 0.692 2.75 492.0 475.0 0.722 0.709 3.00 502.0 500.0 0.730 0.728 2.25 512.0 506.0 0.737 0.733 3.50 528.0 524.0 0.750 0.747 3.75 540.0 540.0 0.759 0.759 4.00 544.0 562.0 0.762 0.775 4.25 559.0 561.0 0.773 0.775 4.50 568.0 562.0 0.780 0.775 4.75 570.0 570.0 0.781 0.781 5.00 562.0 568.0 0.775 0.780 5.25 553.0 550.0 0.769 0.766 5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.0 0.741 0.755 6.25 500.0 502.0<	1.50	386.0	386.0	0.642	0.642
2.25 456.0 447.0 0.695 0.688 2.50 472.0 452.0 0.707 0.692 2.75 492.0 475.0 0.702 0.709 3.00 502.0 500.0 0.730 0.728 3.25 512.0 506.0 0.737 0.733 3.50 528.0 524.0 0.750 0.747 3.75 540.0 540.0 0.759 0.759 4.00 544.0 562.0 0.762 0.775 4.00 544.0 562.0 0.762 0.775 4.50 568.0 562.0 0.762 0.775 4.50 568.0 562.0 0.780 0.775 4.50 568.0 562.0 0.780 0.775 4.50 570.0 570.0 0.781 0.781 5.00 562.0 568.0 0.775 0.780 5.25 553.0 550.0 0.769 0.766 5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.0<	1.75	409 •0	408.0	0.659	0.658
2.50 472.0 452.0 0.707 0.692 2.75 492.0 475.0 0.722 0.709 3.00 502.0 500.0 0.730 0.728 2.25 512.0 506.0 0.737 0.733 3.50 528.0 524.0 0.750 0.747 3.75 540.0 540.0 0.759 0.759 4.00 544.0 562.0 0.762 0.775 4.25 559.0 561.0 0.773 0.775 4.50 568.0 562.0 0.780 0.775 4.75 570.0 570.0 0.781 0.781 5.00 562.0 568.0 0.775 0.780 5.25 553.0 550.0 0.769 0.766 5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.0 0.741 0.750 6.00 506.0 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0<	2.00	437.0	435.0	C•680	0.679
2.75 492.0 475.0 0.722 0.709 3.00 502.0 500.0 0.730 0.728 2.25 512.0 506.0 0.737 0.733 3.50 528.0 524.0 0.750 0.747 3.75 540.0 540.0 0.759 0.759 4.00 544.0 562.0 0.762 0.775 4.25 559.0 561.0 0.773 0.775 4.50 568.0 562.0 0.780 0.775 4.75 570.0 570.0 0.781 0.781 5.00 562.0 568.0 0.775 0.780 5.25 553.0 550.0 0.769 0.766 5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.0 0.741 0.750 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0<	2. 25	456.0	447 •0	0 •695	0.688
3.00 50 2.0 500.0 0.730 0.728 3.25 512.0 506.0 0.737 0.733 3.50 528.0 524.0 0.750 0.747 3.75 540.0 540.0 0.759 0.759 4.00 544.0 562.0 0.762 0.775 4.00 544.0 562.0 0.762 0.775 4.25 559.0 561.0 0.773 0.775 4.50 568.0 562.0 0.780 0.775 4.75 570.0 570.0 0.781 0.781 5.00 562.0 568.0 0.775 0.780 5.25 553.0 550.0 0.769 0.766 5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.0 0.741 0.750 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0	2.50	47 2.0	452.0	0.707	0.692
2.25 512.0 506.C 0.737 0.733 3.5C 528.0 524.0 0.750 0.747 3.75 540.0 540.0 0.759 0.759 4.00 544.0 562.0 0.762 0.775 4.25 559.0 561.0 0.773 0.775 4.50 568.0 562.0 C.780 0.775 4.75 570.0 570.0 0.781 0.781 5.00 562.0 568.0 0.775 0.780 5.25 552.0 550.0 0.769 0.766 5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.C 0.741 0.750 6.CC 506.0 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 C.680 0.709 7.25 422.0 455.0<	2.75	492.0	475.0	0.722	0 •709
3.5C 528.0 524.0 0.750 0.747 3.75 540.0 540.0 0.759 0.759 4.00 544.0 562.0 0.762 0.775 4.25 559.0 561.0 0.773 0.775 4.50 568.0 562.0 C.780 0.775 4.75 570.0 570.0 0.781 0.781 5.00 562.0 568.0 0.775 0.780 5.25 553.0 550.0 0.769 0.766 5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.0 0.741 0.750 6.00 506.0 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 0.680 0.709 7.25 422.0 455.0 0.669 0.683 7.75 385.0 425.0<	3.00	50 2.0	500.0	0.730	0.728
3.75 540.0 540.0 0.759 0.759 4.00 544.0 562.0 0.762 0.775 4.25 559.0 561.0 0.773 0.775 4.50 568.0 562.0 C.780 0.775 4.75 570.0 570.0 0.781 0.781 5.00 562.0 568.0 0.775 0.780 5.25 553.0 550.0 0.769 0.766 5.50 542.0 547.0 0.769 0.766 5.75 517.0 528.0 0.741 0.750 6.CC 506.0 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 0.680 0.709 7.25 422.0 455.0 0.669 0.694 7.50 403.0 440.0 0.655 0.683 7.75 385.0 425.0<	3.25	512.0	506 • C	0.737	0.733
4.00 544.0 562.0 0.762 0.775 4.25 559.0 561.0 0.773 0.775 4.50 568.0 562.0 0.780 0.775 4.75 570.0 570.0 0.781 0.781 5.00 562.0 568.0 0.775 0.780 5.25 553.0 550.0 0.769 0.766 5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.0 0.741 0.750 6.00 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 0.689 0.714 7.50 422.0 455.0 0.669 0.694 7.50 403.0 440.0 0.655 0.683 7.75 385.0 425.0 0.641 0.671 8.00 357.0 395.0 0.620<	3.5C	528.0	524 •0	0.750	0.747
4.25 559.0 561.0 0.773 0.775 4.50 568.0 562.0 C.780 0.775 4.75 570.0 570.0 0.781 0.781 5.00 562.0 568.0 0.775 0.780 5.25 552.0 550.0 0.769 0.766 5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.0 0.741 0.750 6.00 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 0.680 0.709 7.25 422.0 455.0 0.669 0.694 7.50 403.0 440.0 0.655 0.683 7.75 385.0 425.0 0.641 0.671 8.00 357.0 395.0 0.620 0.649 8.25 327.0 370.0 0.597<	3.75	540.0	540.0	0.759	0.759
4.50 568.0 562.0 C.780 0.775 4.75 570.0 570.0 0.781 0.781 5.00 562.0 568.0 0.775 0.780 5.25 553.0 550.0 0.769 0.766 5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.0 0.741 0.750 6.00 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 0.680 0.709 7.25 422.0 455.0 0.669 0.694 7.50 403.0 440.0 0.655 0.683 7.75 385.0 425.0 0.641 0.671 8.00 357.0 395.0 0.620 0.649 8.25 327.0 370.0 0.597 0.630 8.75 260.0 264.0 0.546<	4.00	544.0	562.0	0.762	0.775
4. 75 570.0 570.0 0.781 0.781 5.00 562.0 568.0 0.775 0.780 5. 25 552.0 550.0 0.769 0.766 5. 50 542.0 547.0 0.760 0.764 5. 75 517.0 528.0 0.741 0.750 6. CC 506.0 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6. 50 472.0 494.0 0.707 0.724 6. 75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 0.680 0.709 7. 25 422.0 455.0 0.669 0.694 7. 50 403.0 440.0 0.655 0.683 7. 75 385.0 425.0 0.641 0.671 8. 25 327.0 370.0 0.597 0.630 8. 50 284.0 316.0 0.564 0.589 8. 75 260.0 264.0 0.546 0.549 9. 60 213.0	4.25	559•0	561 •0	0.773	0.775
5.00 562.0 568.0 0.775 0.780 5.25 552.0 550.0 0.769 0.766 5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.0 0.741 0.750 6.00 506.0 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 0.680 0.709 7.25 422.0 455.0 0.669 0.694 7.50 403.0 440.0 0.655 0.683 7.75 385.0 425.0 0.641 0.671 8.00 357.0 395.0 0.620 0.649 8.25 327.0 370.0 0.597 0.630 8.75 260.0 264.0 0.546 0.549 9.00 213.0 229.0 0.510 0.523 9.25 182.0 195.0<	4.50	568.0	562.0	C.780	0.775
5.25 552.0 550.0 0.769 0.766 5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.0 0.741 0.750 6.00 506.0 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 0.680 0.709 7.25 422.0 455.0 0.669 0.694 7.50 403.0 440.0 0.655 0.683 7.75 385.0 425.0 0.641 0.671 8.00 357.0 395.0 0.620 0.649 8.25 327.0 370.0 0.597 0.630 8.50 284.0 316.0 0.564 0.589 8.75 260.0 264.0 0.546 0.549 9.00 213.0 229.0 0.510 0.523 9.25 182.0 195.0<	4. 75	570.0	570 •0	0.781	0.781
5.50 542.0 547.0 0.760 0.764 5.75 517.0 528.0 0.741 0.750 6.00 506.0 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 0.680 0.709 7.25 422.0 455.0 0.669 0.694 7.50 403.0 440.0 0.655 0.683 7.75 385.0 425.0 0.641 0.671 8.00 357.0 395.0 0.620 0.649 8.25 327.0 370.0 0.597 0.630 8.50 284.0 316.0 0.564 0.589 8.75 260.0 264.0 0.546 0.549 9.00 213.0 229.0 0.510 0.523 9.25 182.0 195.0 0.487 0.497	5.00	562.0	568.0	0.775	0.780
5.75 517.0 528.0 0.741 0.750 6.00 506.0 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 0.680 0.709 7.25 422.0 455.0 0.669 0.694 7.50 403.0 440.0 0.655 0.683 7.75 385.0 425.0 0.641 0.671 8.00 357.0 395.0 0.620 0.649 8.25 327.0 370.0 0.597 0.630 8.50 284.0 316.0 0.564 0.589 8.75 260.0 264.0 0.546 0.549 9.00 213.0 229.0 0.510 0.523 9.25 182.0 195.0 0.487 0.497	5. 25	553.0	550.0	0.769	0.766
6. CC 506.0 518.0 0.733 0.742 6.25 500.0 502.0 0.728 0.730 6. 50 472.0 494.0 0.707 0.724 6. 75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 C.680 0.709 7. 25 422.0 455.0 0.669 0.694 7. 50 403.0 440.0 0.655 0.683 7. 75 385.0 425.0 0.641 0.671 8. 00 357.0 395.0 0.620 0.649 8. 25 327.0 370.0 0.597 0.630 8. 50 284.0 316.0 0.564 0.589 8. 75 260.0 264.0 0.546 0.549 9. 00 213.0 229.0 C.510 0.523 9. 25 182.0 195.0 0.487 0.497	5.50	542.0	547 •0	0.760	0.764
6.25 500.0 502.0 0.728 0.730 6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 C.680 0.709 7.25 422.0 455.0 0.669 0.694 7.50 403.0 440.0 0.655 0.683 7.75 385.0 425.0 0.641 0.671 8.00 357.0 395.0 0.620 0.649 8.25 327.0 370.0 0.597 0.630 8.50 284.0 316.0 0.564 0.589 8.75 260.0 264.0 0.546 0.549 9.00 213.0 229.0 C.510 0.523 9.25 182.0 195.0 0.487 0.497	5.75	517.0	528. C	0.741	0.750
6.50 472.0 494.0 0.707 0.724 6.75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 C.680 0.709 7.25 422.0 455.0 0.669 0.694 7.50 403.0 440.0 0.655 0.683 7.75 385.0 425.0 0.641 0.671 8.00 357.0 395.0 0.620 0.649 8.25 327.0 370.0 0.597 0.630 8.50 284.0 316.0 0.564 0.589 8.75 260.0 264.0 0.546 0.549 9.00 213.0 229.0 C.510 0.523 9.25 182.0 195.0 0.487 0.497	6.CC	506.0	51 8.0	0.733	0.742
6. 75 460.0 481.0 0.698 0.714 7.00 436.0 474.0 C.680 0.709 7. 25 422.0 455.0 0.669 0.694 7. 50 403.0 440.0 0.655 0.683 7. 75 385.0 425.0 0.641 0.671 8. 00 357.0 395.0 0.620 0.649 8. 25 327.0 370.0 0.597 0.630 8. 50 284.0 316.0 0.564 0.589 8. 75 260.0 264.0 0.546 0.549 9. 00 213.0 229.0 C.510 0.523 9. 25 182.0 195.0 0.487 0.497	6.25	500.0	502.0	0.728	0.730
7.00 436.0 474.0 C.680 0.709 7.25 422.0 455.0 0.669 0.694 7.50 403.0 440.0 0.655 0.683 7.75 385.0 425.0 0.641 0.671 8.00 357.0 395.0 0.620 0.649 8.25 327.0 370.0 0.597 0.630 8.50 284.0 316.0 0.564 0.589 8.75 260.0 264.0 0.546 0.549 9.00 213.0 229.0 C.510 0.523 9.25 182.0 195.0 0.487 0.497	6.50	472.0	494-0	0.707	0.724
7. 25 422.0 455.0 0.669 0.694 7. 50 403.0 440.0 0.655 0.683 7. 75 385.0 425.0 0.641 0.671 8. 00 357.0 395.0 0.620 0.649 8. 25 327.0 370.0 0.597 0.630 8. 50 284.0 316.0 0.564 0.589 8. 75 260.0 264.0 0.546 0.549 9. C0 213.0 229.0 C.510 0.523 9. 25 182.0 195.0 0.487 0.497	6.75	460.0	481 •0	0.698	0.714
7.50 403.0 440.0 0.655 0.683 7.75 385.0 425.0 0.641 0.671 8.00 357.0 395.0 0.620 0.649 8.25 327.0 370.0 0.597 0.630 8.50 284.0 316.0 0.564 0.589 8.75 260.0 264.0 0.546 0.549 9.00 213.0 229.0 0.510 0.523 9.25 182.0 195.0 0.487 0.497	7.00	436.0	474.0	C. 680	0.709
7.75 385.0 425.0 0.641 0.671 8.00 357.0 395.0 0.620 0.649 8.25 327.0 370.0 0.597 0.630 8.50 284.0 316.0 0.564 0.589 8.75 260.0 264.0 0.546 0.549 9.00 213.0 229.0 0.510 0.523 9.25 182.0 195.0 0.487 0.497	7. 25	422.0	455.0	0.669	0.694
E. 00 357.0 395.0 0.620 0.649 8.25 327.0 370.0 0.597 0.630 8.50 284.0 316.0 0.564 0.589 8.75 260.0 264.0 0.546 0.549 9.00 213.0 229.0 0.510 0.523 9.25 182.0 195.0 0.487 0.497	7.50	403 •0	440 •0	0.655	0.683
8.25 327.0 370.0 0.597 0.630 8.50 284.0 316.0 0.564 0.589 8.75 260.0 264.0 0.546 0.549 9.00 213.0 229.0 0.510 0.523 9.25 182.0 195.0 0.487 0.497	7.75	385.0	425.0	0.641	0.671
8.50 284.0 316.0 0.564 0.589 8.75 260.0 264.0 0.546 0.549 S.CO 213.0 229.0 C.510 0.523 S.25 182.0 195.0 0.487 0.497	E. 00	.357.0	395 •0	0.620	0.649
8.75 260.0 264.0 0.546 0.549 9.00 213.0 229.0 0.510 0.523 9.25 182.0 195.0 0.487 0.497	8.25	327.0	370-0	0. 597	0. 63 0
\$.60 213.0 229.0 \$.510 0.523 \$.25 182.0 195.0 0.487 0.497	€. 50	284.0	316.0	0.564	0.589
5. 25 182.0 195.0 0.487 0.497	8.75	260.0	264.0	0.546	0.549
70 67	9.00	213.0	229.0	C. 510	0.523
	9. 25	182.0	195.0		0.497

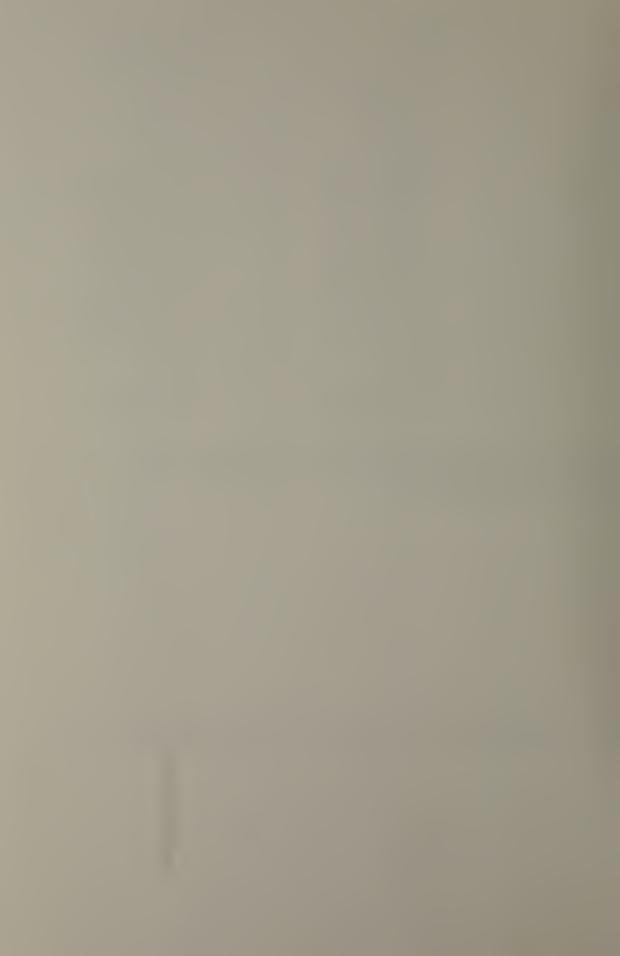
Table VII (Continued)



Variable	Value	Uncertainty
T _S , TAMB	521 °R	± 1 °R
T _P , TUPT	1316 °R	± 2 °R
B,Pa	30.08 in Hg	± .005 in Hg
DELPN	6.40 in H ₂ O	± .05 in H ₂ O
PU-PA	9.10 in H ₂ O	± .05 in H ₂ O
PA-PS, P	.26 in H ₂ O	± .005 in H ₂ O
FHZ	101 Hz	± 1 Hz
PNH	4.40 in Hg	± .05 in Hg

Values are for the mixing stack with one diffuser ring, TUPT = 850 °F, Run Number Two

TABLE VIII. Uncertainties in Measured Values from Table III



APPENDIX A

OPERATION OF THE COMBUSTION GAS GENERATOR

A. COMPRESSOR LIGHT OFF

The primary air flow is supplied by the Carrier model 18P350 centrifugal air compressor located in Building 248. This compressor's cooling system is piped into the cooling tower system located behind the building. Figure 36 gives a schematic of the compressor layout.

In preparation for compressor light off ensure that the cooling water valve to the Sullivan compressor is closed, and that air supply valves to other experiments are closed. Start the cooling tower pump and fan by pushing both start buttons located on the south wall of Building 248 (Figure 37). If necessary, vent the pump inlet to achieve flow through the pump. The compressor can then be started by completing the following steps.

- 1) Check the sight glass on the external oil sump.
- 2) Ensure that the compressor butterfly suction damper in the airstream between the filter (on the roof) and the compressor is closed (Figure 38).
- 3) Start the auxiliary oil pump by positioning the onoff automatic switch (Figure 39) in the "hand" position.
- 4) Open fully the inlet water valve to the oil cooler (Figure 38).
- 5) When the oil pressure rises to at least 16 PSIG, start the compressor.



- 6) When the compressor is up to speed, switch the auxiliary oil pump to "automatic."
- 7) Open the butterfly suction damper.

Notes:

- 1) Normal oil pressure supplied by the auxiliary oil pump is 30 PSIG. Normal oil pressure supplied by the attached oil pump is 24 PSIG. When in "automatic" the auxiliary oil pump will start if oil pressure falls to 6 PSIG.
- 2) Normal outlet temperature from the oil cooler is
 100 F to 105 F. Normal bearing temperatures are
 140 F to 145 F. Check the bearings periodically
 during operation to ensure temperatures do not
 exceed 185 F.

B. GAS GENERATOR LIGHT OFF

After the supply air compressor is in operation, the following is a recommended starting sequence.

- Energize the main power panel and the thermocouple and mass flowmeter readouts, and open the fuel inlet valves.
- 2) Calculate the required mass flow rate to achieve the desired uptake Mach number, M_u. The formula for this calculation (derived in Reference [5]) follows:

$$M_{u} = \frac{C_{1}(\dot{m}_{a} + \dot{m}_{f}) \text{TUPT}^{0.5}}{\frac{PUP}{13.572} + B}$$



where

Cl = constant due to unit conversions and ratio
 of specific heats, depends on TUPT;
 approximately .05

TUPT = uptake temperature (degrees R)

PUP = uptake pressure (inch H₂0)

B = atmospheric pressure (inch Hg)

 \dot{m}_a = mass flow rate of air (lbm/sec)

3) Figure 25 gives the primary air mass flow rate versus the pressure product. The pressure product comes from the transition nozzle calibration and is defined

where where

PNH = nozzle high pressure (inch Hg)

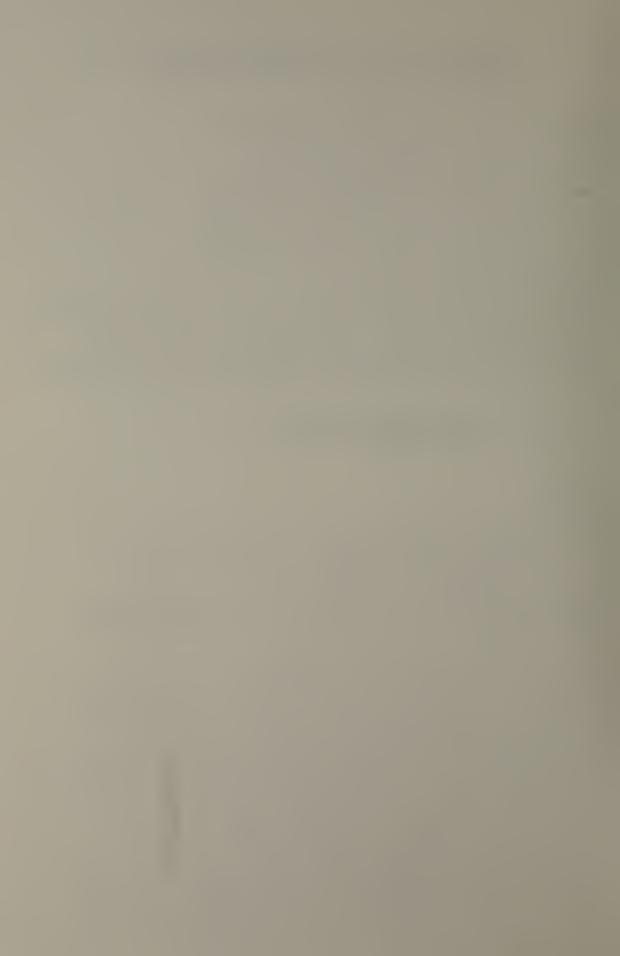
B = atmospheric pressure (inch Hg)

DELPN = pressure drop across entrance nozzle (inch
H₂O)

TUPT = uptake temperature (degrees R)

From Figure 25 find the pressure product corresponding to the required mass flow rate found in step 2 above.

4) With the burner air valve 100% open and the bypass air valve (Figure 3) 50% open, open the main air supply globe valve (Figure 40) until the desired pressure product is reached. Good light off values are 3.7 inches Hg for PNH and 6.1 inches water for



Do not allow burner temperature to exceed 1500 F.

c) Simultaneously with (b), open the fuel recirculation valve to achieve a fuel flow meter reading of about 110 Hz.

C. TEMPERATURE ADJUSTMENT

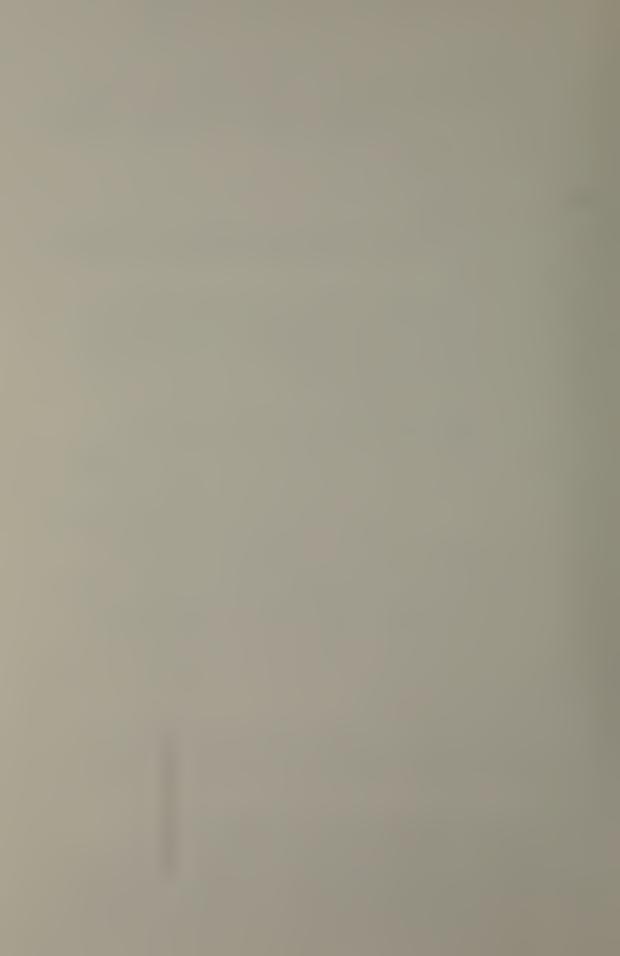
Temperature adjustment is an iterative process consisting of the following steps.

- Adjust the fuel control valve to achieve approximately the desired uptake temperature, while monitoring the burner temperature.
- 2) Check the pressure product. Re-adjust the main air supply globe valve to obtain the correct value.
- 3) Adjust the fuel control valve and the bypass air valve (Figure 3) to achieve the desired temperature.

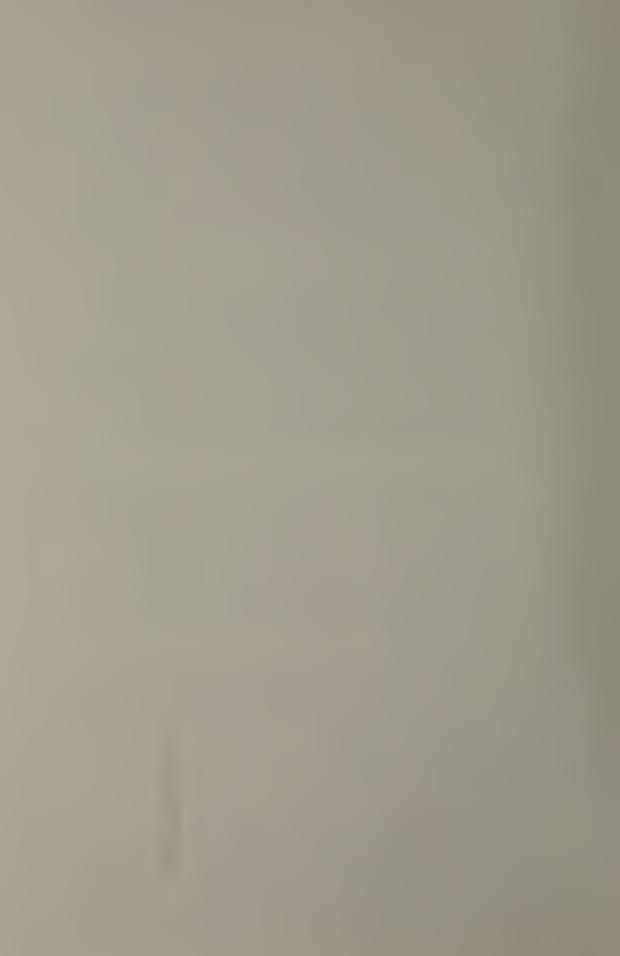
 Rough temperature control is achieved with the bypass air valve and fine control with the fuel control valve. The fuel pump outlet valve must be mostly closed to achieve the low flow rates required for the low uptake temperatures.

Normally the burner air valve is kept 100% open, but at low uptake temperatures closing this valve to about 60% open can reduce smoking.

Although desired Mach number can be achieved over a wide range of temperatures and pressures, the gas generator runs smoothly over a much narrower band. Surging, pressure



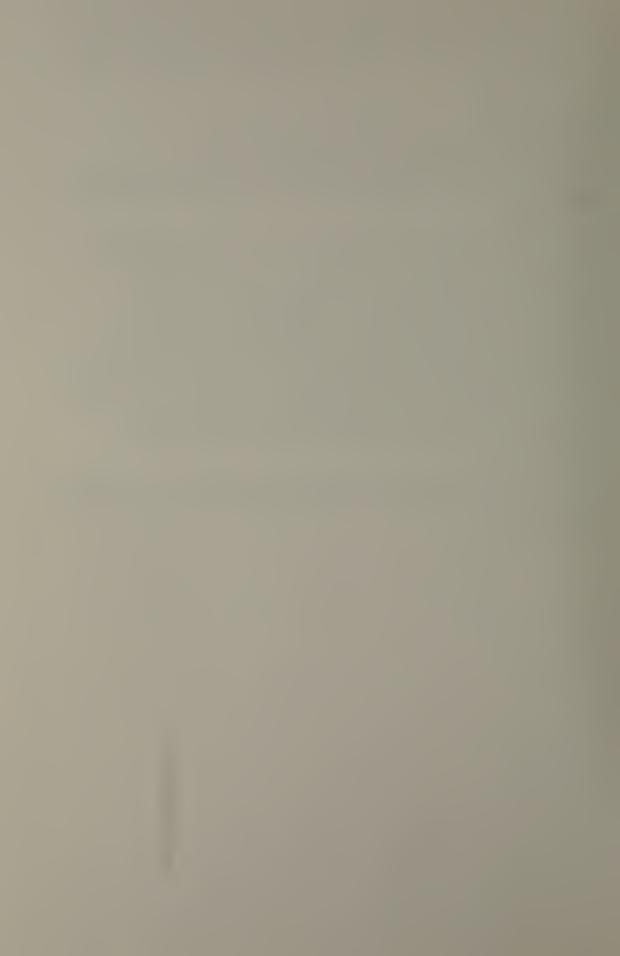
- DELPN. The globe valve is open about $2\frac{1}{4}$ turns to achieve these values.
- 5) Open the bypass air valve to 80% open. PNH will drop to about 1.8 inches Hg and DELPN may climb to around 6.8 inches H₂O. If measured, pressure drop across the U bend would be about 1 inch H₂O.
- 6) Turn on the fuel supply pump and the high pressure fuel pump.
- 7) Adjust the fuel control valve to obtain 150 PSIG on the high pressure fuel gage (Figure 5).
- 8) Energize the igniter plug and glow coil by depressing the spring-loaded igniter switch. Hold this switch down for a few seconds before opening the fuel shutoff.
- 9) Open the fuel shutoff valve by putting the emergency shutoff switch in the "on" position. Ignition should be noted within three to four seconds. If ignition does not occur quickly, turn off the emergency shutoff switch.
- 10) If ignition does not occur, check the settings of all valves and controls, and let system purge before attempting light off again.
- 11) When ignition does occur
 - a) Let go the igniter switch,
 - b) Begin closing the bypass air valve immediately while monitoring burner temperature. Continue closing the bypass air valve to about 50% open.



pulses, and unstable burner temperatures are the indications that the machinery is not in the comfortable operating zone.

D. SYSTEM SHUT DOWN

- 1) Close the emergency fuel shutoff valve.
- 2) Turn off the fuel supply pump and the high pressure fuel pump.
- 3) Allow the system to cool for five to ten minutes.
- 4) Close the compressor butterfly suction damper.
- 5) Turn off the compressor. Immediately turn the auxiliary oil pump switch to the "hand" position.
- 6) Allow the bearing temperatures to reach 80 F before turning off the oil pump and the cooling tower pump and fan.
- 7) Close the fuel inlet valves and the main air supply globe valve.



APPENDIX B

DETERMINATION OF THE EXPONENT IN THE NONDIMENSIONAL PUMPING COEFFICIENT

The method used to determine the value of the exponent n in equation (13) is outlined below.

- (1) Select a given geometry, assume reasonable values for K_p , K_m and f, and calculate C_1 , C_2 and C_3 for use in equation (11b).
- (2) Set $T^* = 1.0$, $\Delta P^* = 0$, and solve for W^* max. Equation (11b) plots as indicated in Figure 27; for $\Delta P^* = 0$ and $T^* = 1.0$, the intersection of the curve with the W^*T^* axis yields the value of W^* max. Note that for each value of $T^* < 1.0$ ($T^* = T_S/T_p$ and $T_S < T_p$ therefore $T^* < 1.0$) a different curve will result.
- values assumed and calculated in step (1), calculate $\Delta P^*/T^*$ using equation (11b) with W*T*ⁿ for different values of T* in each case varying W* from 0 to W*max in equal increments of W*max. For each new value of T* tried, vary n until the resulting plots of $\Delta P^*/T^*$ vs W*T*ⁿ for T* < 1.0 come close enough to the initial plot obtained in step (2) where T* = 1.0 that, for all practical purposes, all such plots can be represented by a single curve.
- (4) The value of n which most effectively collapses all performance curves onto the $T^* = 1.0$ case is n = 0.44.



APPENDIX C

UNCERTAINTY ANALYSIS

The experimentally determined pressure coefficient and pumping coefficient are used in determining eductor operating points which in turn provide the basis for comparison and evaluation of eductor system performance. Data for the eductor with one diffuser ring and an uptake temperature of 850 F (Table III) is considered a representative case and is used to calculate representative uncertainties in the pumping and pressure coefficients.

For a single sample measurement the value of a specific variable should be given in the format:

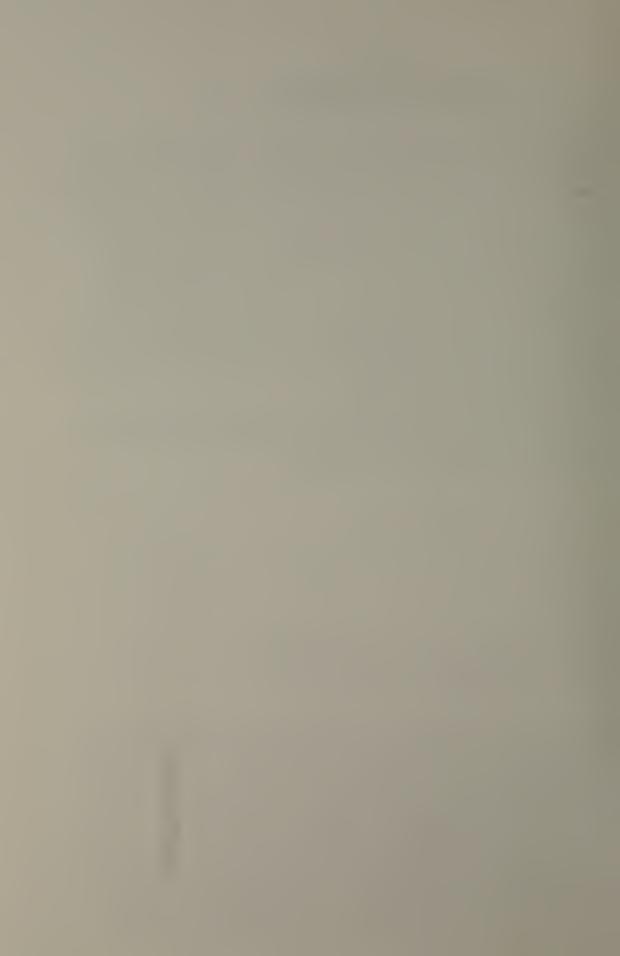
 $x = \bar{x} \pm \delta x$

where

 \bar{x} = mean value of the variable x

 δx = estimated uncertainty in x.

Variations for the variables in the defining equations for the two coefficients are listed in Table VIII. Having described the uncertainties in the basic variables of a relationship, it is now necessary to determine how these uncertainties propagate into the result. Consider the relation where the result R is the product of a sequence of terms.



$$R = x_1^a x_2^b x_3^c$$
 (a)

A reasonable prediction of the uncertainty in the result R is obtained by using the second order equation suggested by Kline and McClintock [6].

$$\delta R = \left[\left(\frac{\partial R}{\partial x_1} \delta x_1 \right)^2 + \left(\frac{\partial R}{\partial x_2} \delta x_2 \right)^2 + \left(\frac{\partial R}{\partial x_2} \delta x_3 \right)^2 \right]^{1/2}$$
(b)

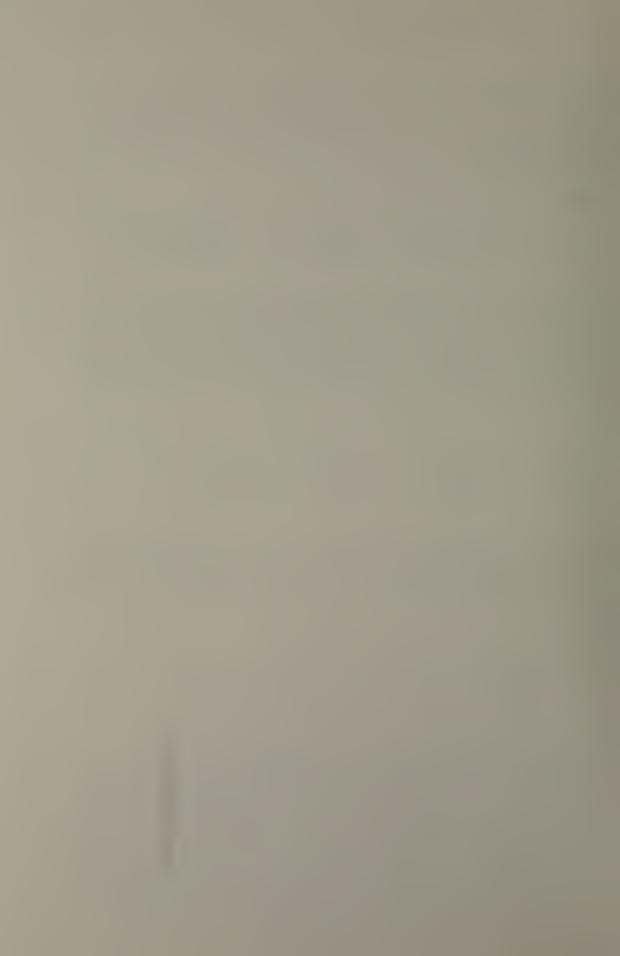
Evaluating the partial derivatives appearing in equation (b), and normalizing by dividing through by result R yields the simplified form of equation (b) which will be used in this analysis.

$$\frac{\delta R}{R} = \left[\left(\frac{a \delta x_1}{x_1} \right)^2 + \left(\frac{b \delta x_2}{x_2} \right)^2 + \left(\frac{c \delta x_3}{x_3} \right)^2 \right]^{1/2}$$
 (c)

Determination of the uncertainty in the pressure coefficient is facilitated by writing it as the product of a series of terms,

$$\frac{\Delta P^*}{T^*} = (\rho_s)^{-1} (\Delta P) (U_p)^{-2} (T^*)^{-1}$$
 (d)

where ΔP represents the pressure difference $(P_a - P_0)$. Constants such as 2 g_c in the equation for the pressure coefficient will be cancelled out when used in equation (c) and are therefore not included in this analysis. Applying equation (c) to the pumping coefficient in equation (d) yields the following expression for its uncertainty:



$$\frac{\delta \frac{\Delta P^*}{T^*}}{\frac{\Delta P^*}{T^*}} = \left[\left(\frac{(-1) \delta \rho_{S}}{\rho_{S}} \right)^2 + \left(\frac{(1) \delta (\Delta P)}{\Delta P} \right)^2 + \left(\frac{(-2) \delta U_{D}}{U_{D}} \right)^2 + \left(\frac{(-1) \delta T^*}{T^*} \right)^2 \right]^{1/2}$$
(e)

Taking into account the respective equations defining the individual variables, the terms of equation (e) are expanded as follows:

$$\rho_{s} = \frac{P_{a}}{R T_{s}}, \quad \left[\frac{\delta \rho_{s}}{\rho_{s}}\right]^{2} = \left[\frac{\delta P_{a}}{P_{a}}\right]^{2} + \left[\frac{\delta T_{s}}{T_{s}}\right]^{2}$$

$$U_{p} = \frac{W_{p}}{\rho_{p} A_{p}}, \quad \left[\frac{\delta U_{p}}{U_{p}}\right]^{2} = \left[\left(\frac{\delta W_{p}}{W_{p}}\right)^{2} + \left(\frac{\delta \rho_{p}}{\rho_{p}}\right)^{2} + \left(\frac{\delta A_{p}}{A_{p}}\right)^{2}\right]$$

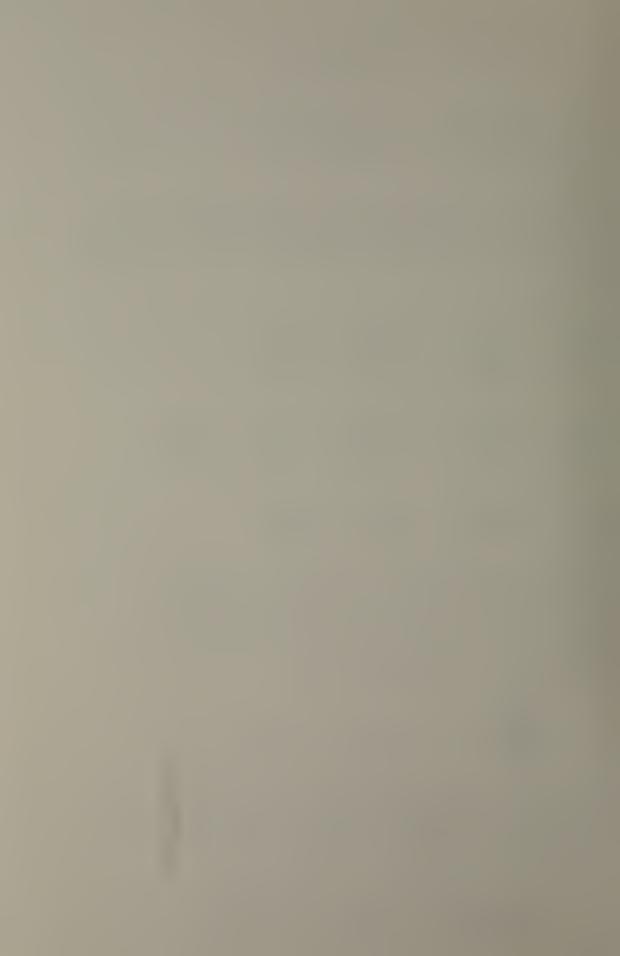
$$T^{*} = \frac{T_{s}}{T_{p}}, \quad \left[\frac{\delta T^{*}}{T^{*}}\right]^{2} = \left[\frac{\delta T_{s}}{T_{s}}\right]^{2} + \left[\frac{\delta T_{p}}{T_{p}}\right]^{2}$$

Using the values of the variable and their respective uncertainties listed in Table VIII, the uncertainty in the pressure coefficient is estimated to be

$$\frac{\delta \left(\frac{\Delta P^*}{T^*}\right)}{\frac{\Delta P^*}{T^*}} = .0194 = \pm 1.9\%$$

By a similar process, the uncertainty in the pumping coefficient is estimated to be

$$\frac{\delta (W*T*^{.44})}{W*T*^{.44}} = .0217 = \pm 2.28.$$



მერმ<mark>ერმემშემდ</mark>ერე მემმებმერი და მისიმების მერის მემმების მერის მერის მერის მერის მერის მერის მერის მერის მერის მ

JA PILL THIS PROGRAM READS RAW DATA FROM THE HOTRIG EXPERIMENT, DATA REDUCTION AND YIELDS TABULAR AND GRAPHICAL GUTPUT. PERFORMS THE ******* VARIABLE NAMES

VARIABLE NAMES

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C1 CONVERSION OF 1971 TO DENSITY

C2 CONVERSION OF DEG FT ODEG R

C4 CONVERSION OF DEG FT ODEG R

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C6 CONVERSION OF DEG FT ODEG R

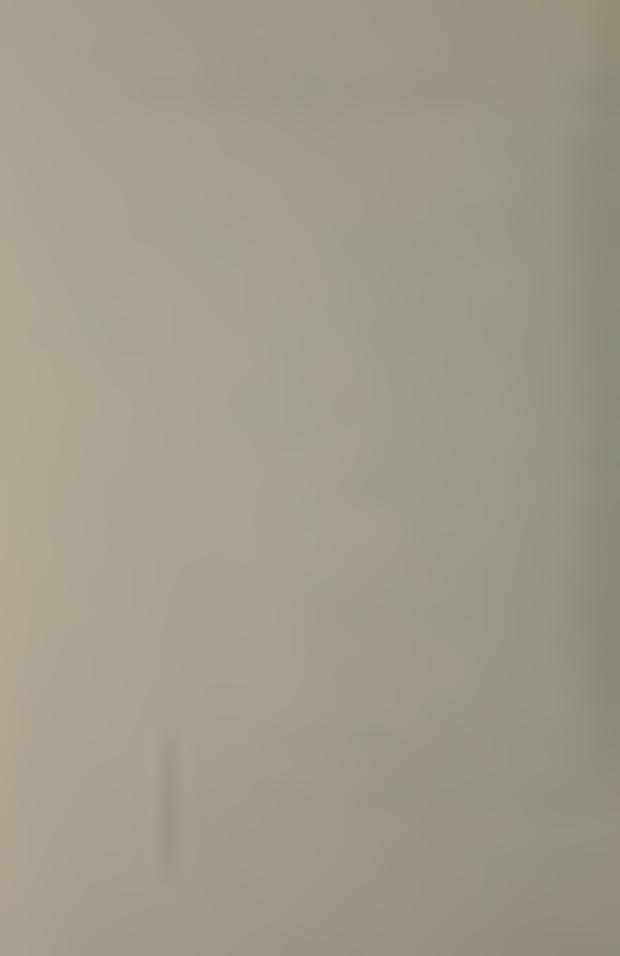
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C7 CONVERSION OF DEG FT ODEG R

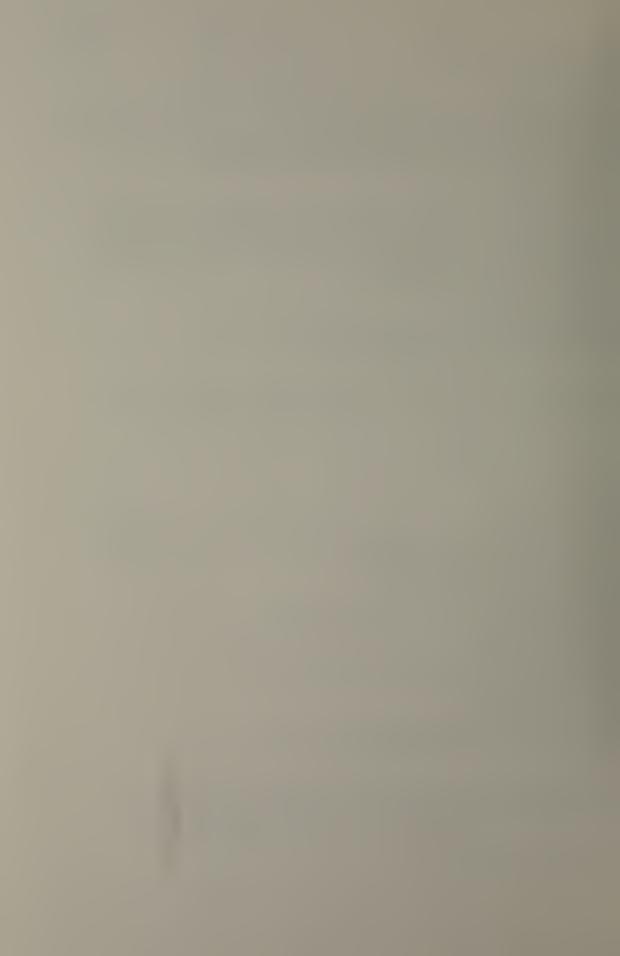
C8 CONVERSION OF DEG FT ODEG R

C9 CONVERSI

**** INPUT AND INITIAL DATA



```
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    JI MENSION DATE(2)
    JI MENSION PNH(10), DELFN(10), TPNH(10), FHZ(10), TRURN(10), TUPT(10),
    *PUPA(10), PAPS(10), TAMB(10), SECAIR(10)
    DIMENSION APA(10), WF(10), WP(10), WS(10), WSTR(10), PSTR(10), TSTR(10),
    *PRTR(10), WSTR44(10), UP(10), UM(10), UMACH(10)
    DIMENSION XO(10), XOMS(6), XOSH(4), XOR1(2), XOR2(2)
    DIMENSION TMR A(6), TMSR(6), TMSHA(4), TMSHA(4), TMR 1A(2), TMR 18(2),
    *TMR2A(2), TMR2B(2)
    DIMENSION $44(10), $PR(10)
                           DATA NNOZ/4/,DP/2.25DC/,DL/7.5100/,AMAP/2.5000/,AP/.110446600/
*,LM$/17.8100/,0M/7.12200/,L0/2.5000/,SD/.500/,AM/.276650400/,
#AUP/.3076148D0/
DATA C1/1.32156600/,C2/13.571700/,C3/459.6700/,C4/5.1940800/
DATA SECA19/0.0C0,5.28300,11.19200,14.72600,27.29300,35.85900,
*52.42500,64.992C0,2=1004.0010/
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DATA XDMS/.5,.75,1.0,1.5,2.0/
DATA XDMS/.5,.75,1.0,1.5,2.0/
DATA XDR2/2.25/
DATA XDR2/2.25,2.5/
  100
C
C
                             DO 90 I=1,NR
READ (5,110) PNH(I), DELPN(I),TPNH(I),FHZ(I),TBURN(I),TUPT(I),
*PUPA(I),PAPS(I),TAMB(I)
FORMAT (10 F8.3)
1000000
                   *********
                             DATA REDUCTION
                                 TUPTR=TUPT(1)+C3
TAMBR=TAMB(I)+C3
TPNHR=TPNH(I)+C3
TPNHR=TPNH(I)+C3
WPA(I)=1.77340D0*DS CRT((PNH(I)*P)*DELPN(I)/TPNHP) + .018088D0
WF(I)=9.59155D-5*FHZ(I) + 3.230-4
WP(I)=WPA(I)+WF(I)
RHCUP=C1*(B+(PUPA(I)/C2))/TUPTR
RHDS=C1*(B-(PUPA(I)/C2))/TAMBR
RHCP=RHOS*TAMBP/TUPTR
RHDA=C1*8/TAMAR
WS(I)=.123808D0*SECAIR(I)*DSQRT(RHOA*PAPS(I))
WSTR(I)=WS(I)/WP(I)
UP(I)=WP(I)/RHCUP/AP
PSTR(I)=(APS(I)*C4/PHOS)/(UP(I)*UP(I)/64.348D0)
UU(I)=WP(I)/RHCUP/AP
RHDA=(WP(I)+WS(I))/((WS(I)/RHOS)+(WP(I)/RHOP))
UM(I)=(PAPS(I)*C4/PHOM/AM
TSTR(I)=TAMBR/TUPTR
WSTR(I)=TAMBR/TUPTR
WSTR(I)=PSTR(I)/TSTR(I)
WSTR44(I)=WSTR(I)*TSTR(I)**.44D0
UMACH(I)=UJ(I)/41.42658D0/DSDRT(GAMMA*TUPTR)
CONTINUE
  20
                     MIXING STACK SECTION
                                     READ (5,120) TMSA, TMSA, TMSHA, TMSHA, TMR 14, TMR 18, TMR 2A, TMR 28
F CRMAT (5F8.1/6F8.1/4F8.1/4F8.1/2F8.1/2F8.1/2F8.1/2F8.1/2F3.1)
  120
CC
CC
                      ***********
```



```
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G LEVEL 21
                                                                 DATE = 79249
                                                                                                13/13/0
  CCC
         TABULAR OUTPUT
  500
  510
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  630
  64 C
      本本本本本本本本本本本本本本本本本本本本本本本本本本本本本本本本本
         GRAPHICAL OUT PUT
      PLOTE RECUIRES REAL*4 INPUT APRAYS
DC 96 J=1,NF
$44(J)=SNGL(WSTR44(J))
$PR(J)=SNGL(PRTP(J))
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*0.),2.5,50.0,300.,6.25,5.0)
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CALL FLOTG (XDRH,TMSHA,4,5,5,0,2,',1,1,',1,0,0,0,0,0,6,25,5,0)
CALL PLOTG (XDR1,TMR1A,2,5,0,2,',1,1,',1,0,0,0,0,0,6,25,5,0)
CALL PLOTG (XDR2,TMP2A,2,7,0,5,',1,',1,0,0,0,0,0,6,25,5,0)
CALL PLOTG (XDR2,TMR2B,2,8,0,5,',1,1,',1,0,0,0,0,0,6,25,5,0)
CALL PLOTG (XDR2,TMR2B,2,8,0,5,',1,1,',1,0,0,0,0,0,0,6,25,5,0)
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LIST OF REFERENCES

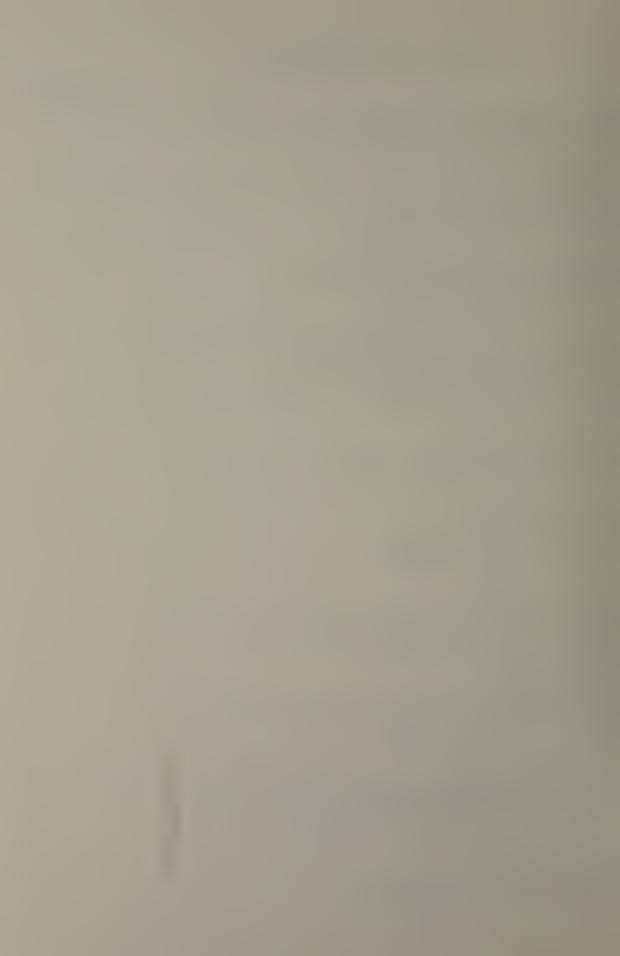
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- Staehli, C. P. and Lemke, R. J., <u>Performance of Multiple</u>
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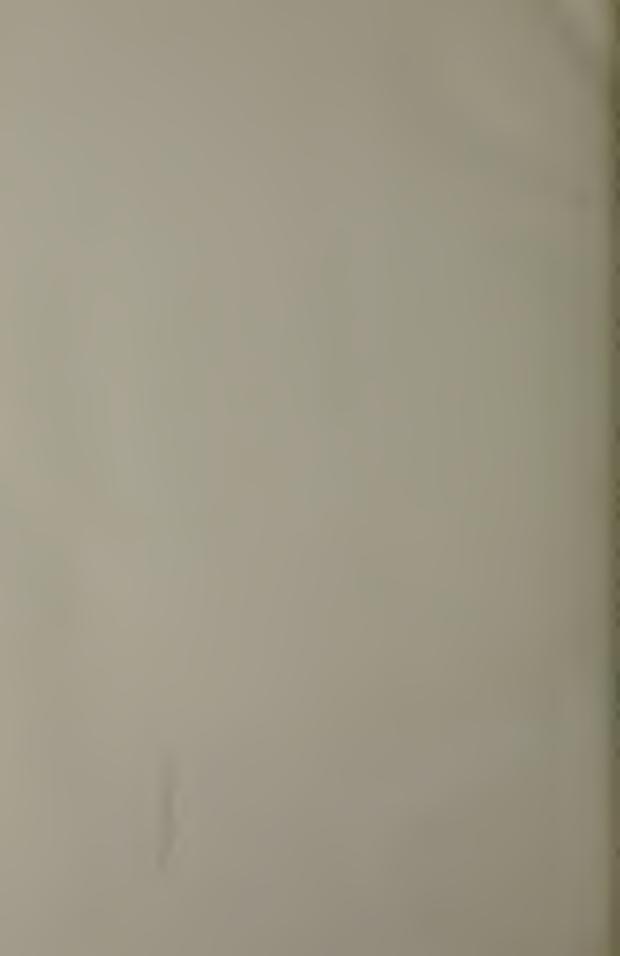


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C.1 Hot flow testing
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